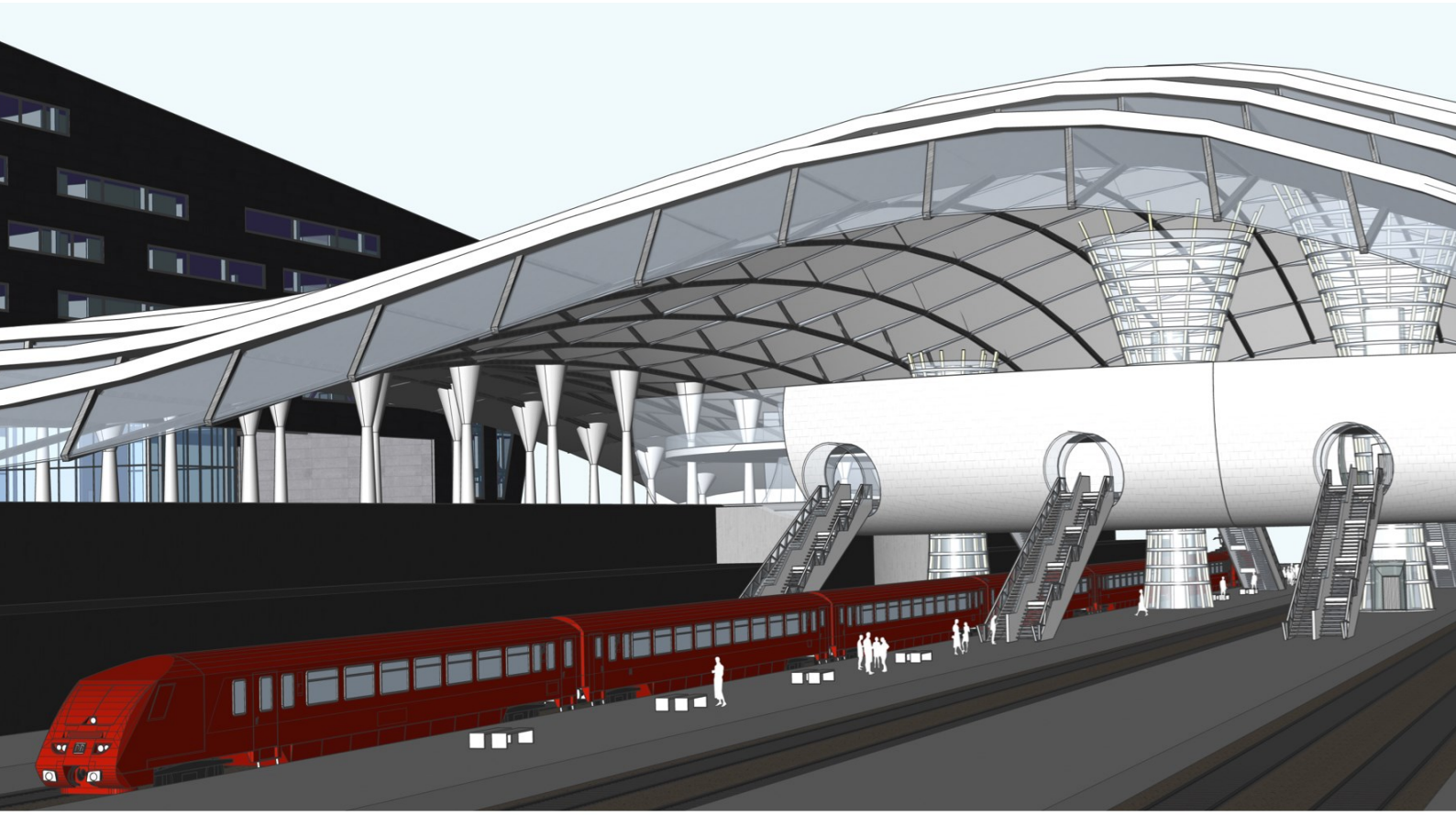


updated for V20

BricsCAD BIM
Training

Contents*

Introduction

1. The step-by-step instructions also have figures included to provide additional context for select steps
2. Modules have "starter .dwg files" that should be used
3. The text in **"bold blue"** indicates BricsCAD BIM commands
4. The text in **"bold black"** is inserted and/or selected values
5. The exercises are in metric units (mm)

Before beginning, make sure the following settings are enabled:

- In the Status Bar (bottom right of your screen): ESNAP, STRACK, DUCS, DYN, QUAD, RT
- In the Command Line: DMEXTRUDEMODE = 3, BIMOSMODE = 1, QUADDISPLAY = 5, (optional - for better on-screen rendering) ANTIALIASSCREEN = 2
- In the Ribbon, under Home tab (Can also be done in the Command Line: SELECTIONMODES = 6)
    - Disable selection of Edges
    - Enable selection of faces
    - Enable selection of Boundaries
- In the Structure Browser Configuration Window: 'Select entities when selected in tree'

* This document can be used by Bricsys Partners to create their own localized BIM training. Bricsys only requests to receive the localized content when finalized.

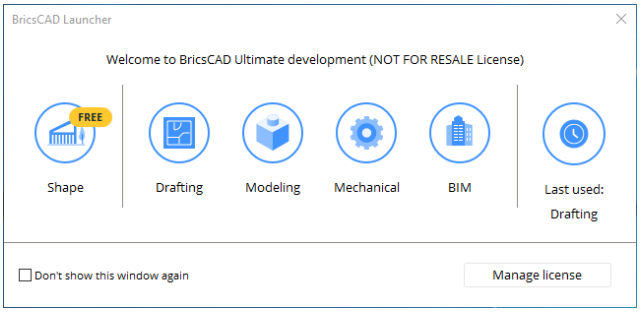
Interface, viewing, and navigation

This module explains BricsCAD BIM V20 interface, shows how to show and hide (selected) entities, makes sections and how to navigate in 3D.

1 Interface

1.1 BricsCAD Launcher

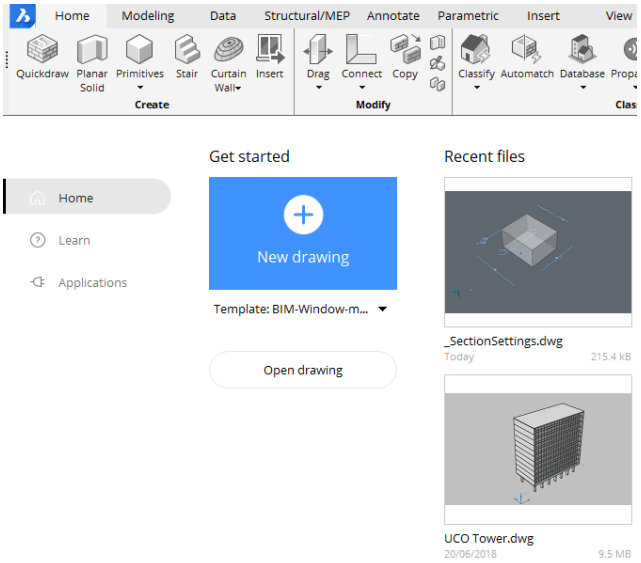
When starting BricsCAD, the Launcher dialog appears. Here you can select your workspace. Since our training is for BIM we will select the BIM workspace.



1.2 Getting Started

In V20 the welcome window, you have 3 main sections (1) HOME, (2) LEARN and (3) APPLICATIONS.

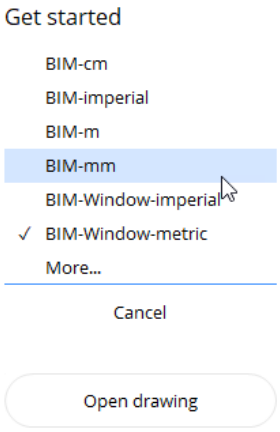
1. From the HOME tab, you can create a new drawing, choose your units, open a drawing or access your most recent files.
2. From the LEARN section, you can access tutorials.
3. From the APPLICATIONS section, you can explore third-party applications.



1.3 New Drawing

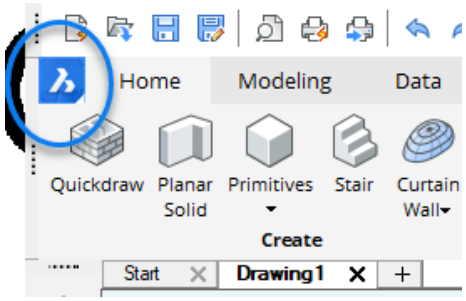
Before starting a New File, check that you use the BIM-mm template. You can change it by scrolling down through the Templates and selecting BIM-mm.

NOTE: Once the model space appears, check that the settings are according to the one mentioned in the introduction.



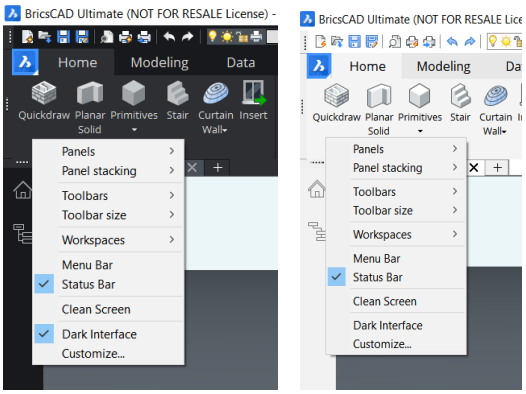
1.4 File Menu

The FILE menu can be accessed through the BricsCAD icon, in the top left corner of the ribbon.



1.5 Dark Interface

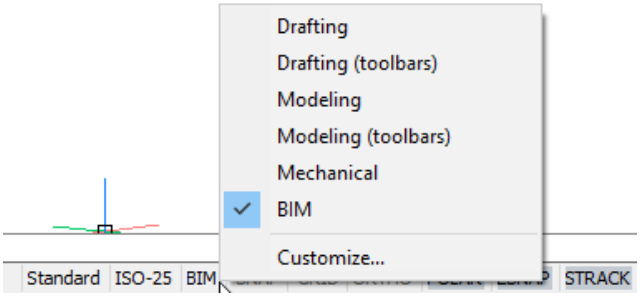
BricsCAD is set by default to have a Dark Interface, but this can be easily changed by right-clicking anywhere in the ribbon or toolbar, and de-selecting **Dark Interface**.



1.6 Workspaces

Switching between workspaces can be done from the status bar. If you right-click on the tab displaying **BIM**, the list of different workspaces will be displayed.

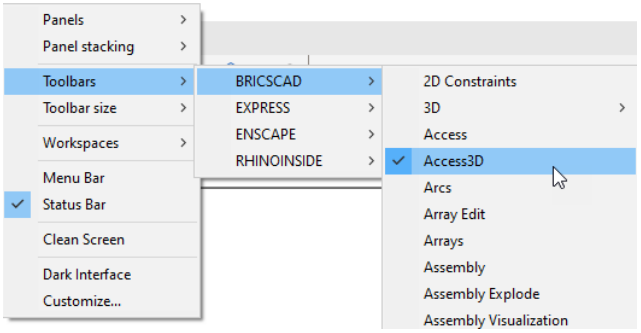
TIP: You can also access the **Workspaces** by right-clicking anywhere in the ribbon or toolbar.



1.7 Access Toolbar

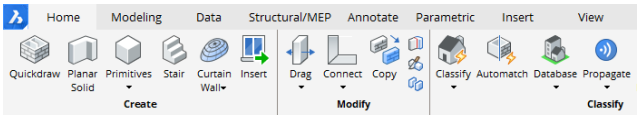
BricsCAD Access toolbar at the top of your screen acts as an Express Toolbar. Here you will find the most used tools when 3D modeling.

You can access this toolbar by right-clicking in the ribbon, selecting toolbars, then BRICSCAD and Access3D.



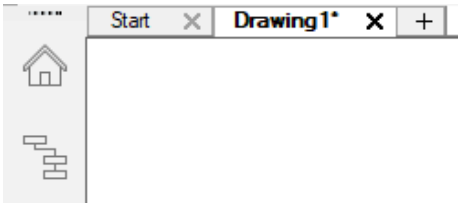
1.8 Ribbon Tabs

Common tools are organized in groups within tabs, each tab corresponds to a group of functionality.



1.9 Drawing Tabs

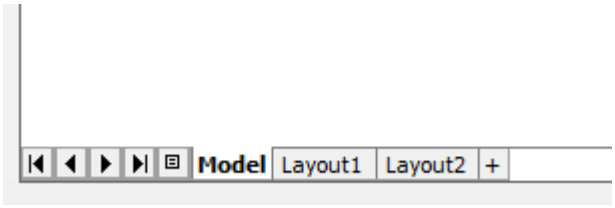
This allows you to easily switch between different open drawings.



TIP: You can also display all open drawings at once by right-clicking on any of the project tabs and selecting to view horizontal or vertical.

1.10 Model Tab

Model Space is an area in which you create two-dimensional and three-dimensional entities based on either the World Coordinate System (WCS) or User Coordinate System (UCS).



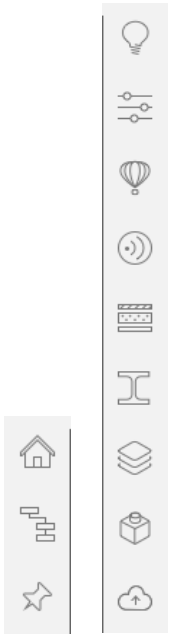
1.11 Layout Tab

The layout tab can also be referred to as paper space. Here is a work environment that provides the model space view at a given scale, depending on the size of the paper.

1.12 Dockable panels

A set of dockable panels is shown on either side of the screen. In the BIM workspace, by default, the Structure browser, Project browser and BCF Panel are pinned to the **left-hand** side.

On the **right-hand** side, you will find the Tips, Properties, Components, Details, Compositions, Profiles, Layers, Mechanical browser, and 24/7 Panel. Most of these will be covered later in this document.

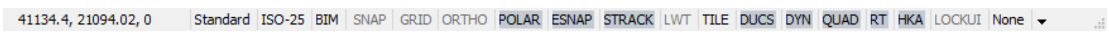


1.14 Commandline

In the lower field, you can type the commands and BricsCAD shows prompt, options and other information regarding the execution of commands here. Press **F2** to show the full command prompt in a separate window, or **Shift + F2** to show/hide the commandline.

1.15 Status Bar

The Status Bar sits along the bottom edge of the BricsCAD application window. It contains a lot of information about the settings in the current drawing.



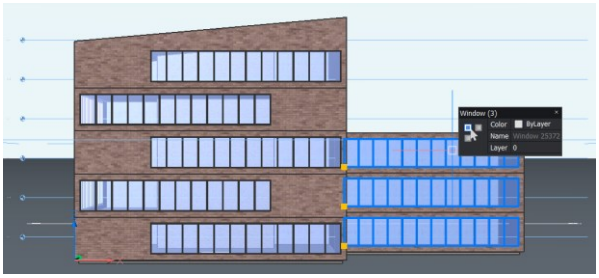
2 Viewing

If you work with many entities in a drawing, everything that you have in the drawing is visible in the view. When you want to temporarily make only a few entities or a particular entity visible and manage them in a view, you can use the Hide or Isolate tools.

2.1 **File:** Select **Template: BIM mm**. Then click on Open drawing. Select file **Building_M1.dwg**.

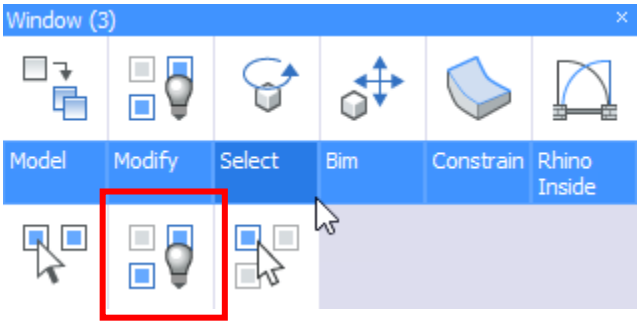
2.2 **Hiding Entities**

The Hide tool temporarily hides the selected entities in the view.



In this drawing, we will hide the windows from the right building

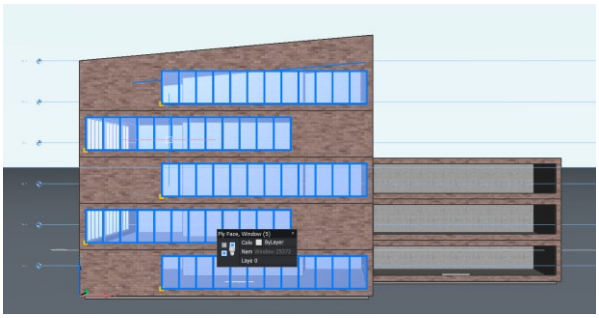
1. Select windows
2. Quad appears, move the cursor to Select tab and click on **HIDE ENTITIES** icon .



All entities that have been selected are hidden in the view.

2.3 **Isolating Entities**

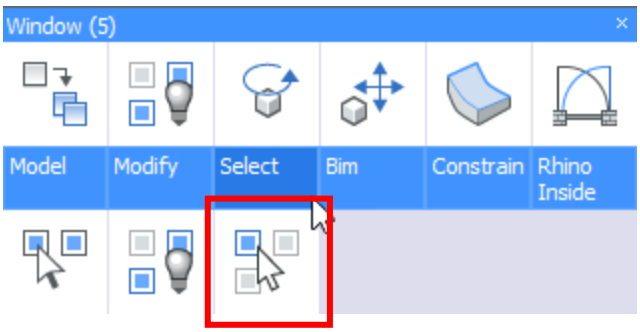
The Isolate tool temporarily hides all entities except those that have been selected.

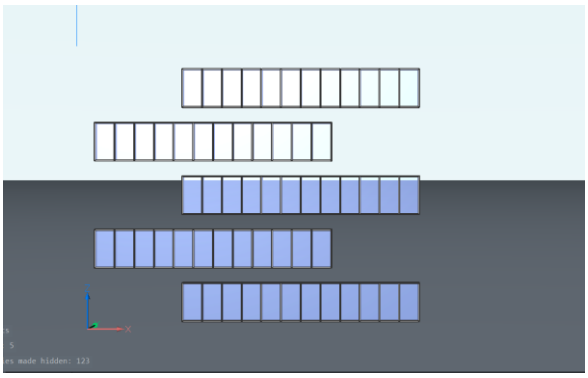


In this model,

1. Select the front windows from the left building.
2. Once the quad appears, go to Select tab and click on **ISOLATE ENTITIES** .

All entities that have been selected are temporarily isolated.





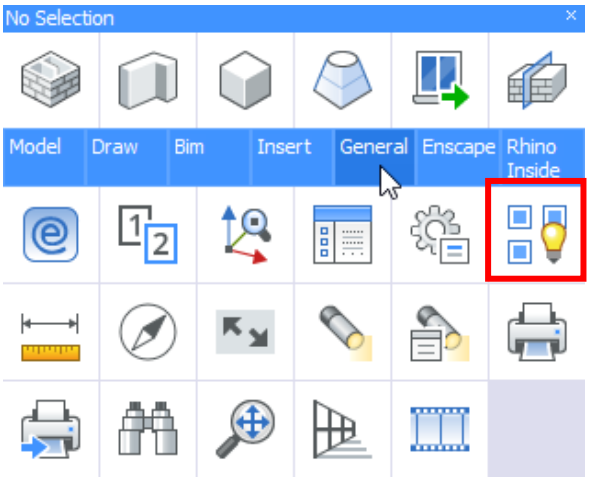
2.4 Showing entities

The Show Entities tool brings back all hidden entities in the view.

Let's bring all entities back to view

1. Right-click in the model space. The quad appears in no selection state
2. Move cursor over the General tab and click on SHOW ENTITIES 

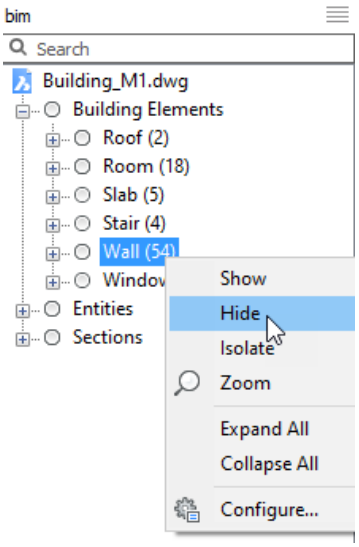
All entities that were temporarily hidden and isolated will be shown.



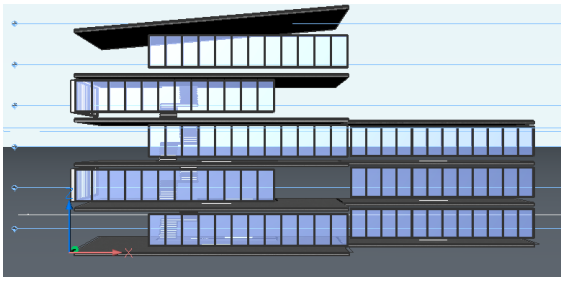
2.5 Structure Browser

The Structure Browser can also be used to hide and isolate selected entities as well as revealing all hidden entities in the model space.

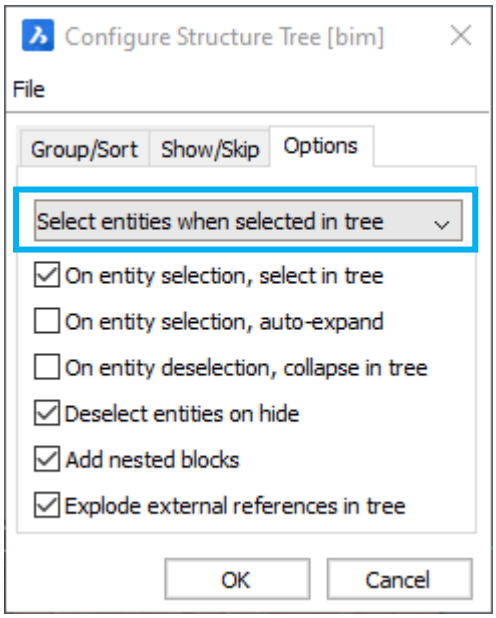
1. Open the **Structure Browser**.
2. Make sure the current configuration is set to bim. If not, click the hamburger menu on the top right corner of the structure browser.
3. Select **Wall** elements. All entities under this element will be selected.
4. Right-click and select Hide.



All the walls have been temporarily hidden.



NOTE: Make sure the settings for the structure browser are correct by clicking on the name **Bim** on top of the structure browser. You will enter a dialog where you need to go to the **Options** tab. There you need to choose the preset **Select entities when selected in tree** from the dropdown.



3 Navigate in 3D

As you navigate around and through your 3D model, the location of the model in space remains constant. It's your current view (viewpoint) of the model that is changing.

3.1 Mouse and Keyboard Navigation

Most used navigation tools are the zoom in/out, pan and orbit which can be easily accessed through the mouse and keyboard.

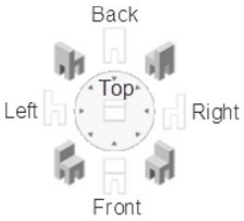
1. **Zoom in/out** – roll the mouse wheel.
2. **Pan** – hold the mouse wheel or middle mouse button.
3. **Orbit** – hold Shift key and mouse wheel.

3.2 View Ribbon Tab

Extra zoom, panning and orbit tools can be found in the View Tab from the ribbon tool.

3.3 LookFrom Navigation Tool

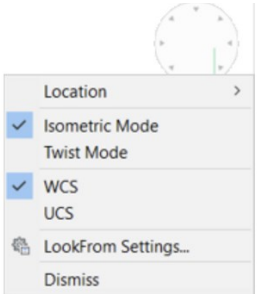
The **LookFrom** tool is displayed in the upper right corner of the drawing area.



Click on different places on the **LookFrom** tool to display the view from standard viewpoints.

TIP: To view Bottom viewpoints hold **CTRL** key.

NOTE: A right-click menu offers access to additional controls and settings. To learn more, refer to BricsCAD Online Help.



3.4.1 BIM Sections

The **DEFINE SECTION**  tool allows you to create a cross-section in your BIM model and thus view the interior details.

1. Select **DEFINE SECTION**  from the No Selection Quad.

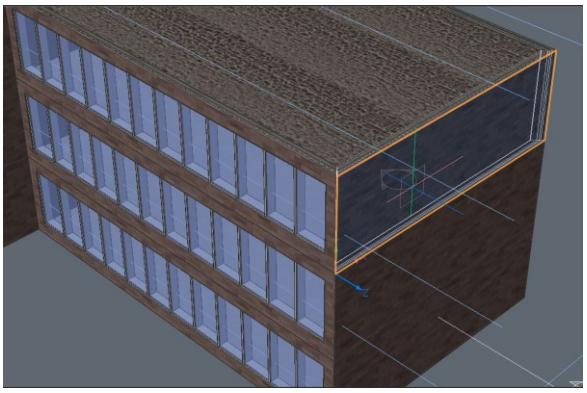
2. You are prompted **Select a point to place section or [Detail/Interior/Scale/Reflected ceiling]:**

   Do one of the following:

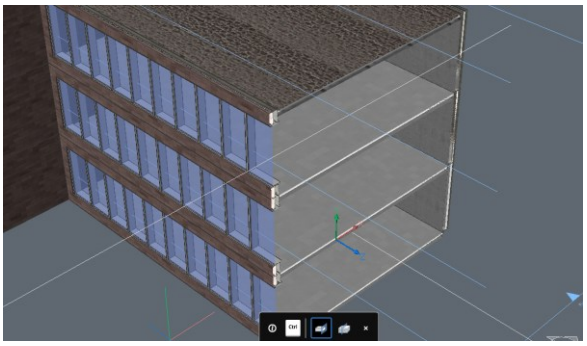
   a. To create a plan section, click a point anywhere outside the model.

   b. Hover the cursor over the face of a 3D solid which is parallel to the section plane you want to create (DUCS needs to be active) and left-click.

   c. Optionally, hit the **Shift** key to lock the highlighted plane, allowing you to start from a point outside the selected 3D solid face and left-click.



   The initial section plane displays dynamically and the 3D model is clipped accordingly.



3. You are prompted **Specify distance:**

   Do one of the following:

   a. Type a value in the dynamic dimension field to offset the section from the initial position.

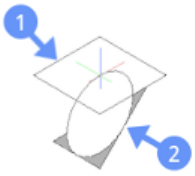
   b. Move the cursor until the section plane is at the location you want it to be and left-click.

   The BIM Section entity is defined

3.4.2 BIM Section types

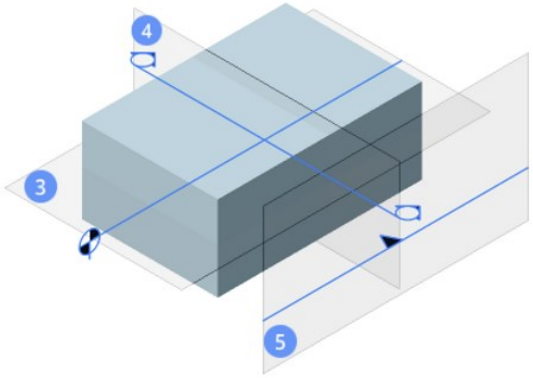
TIP: The **BIM Section** tracker indicates:

1. SECTION PLANE
2. VIEW DIRECTION



NOTE: The Section Type will depend on the section plane directions and its place in the model.

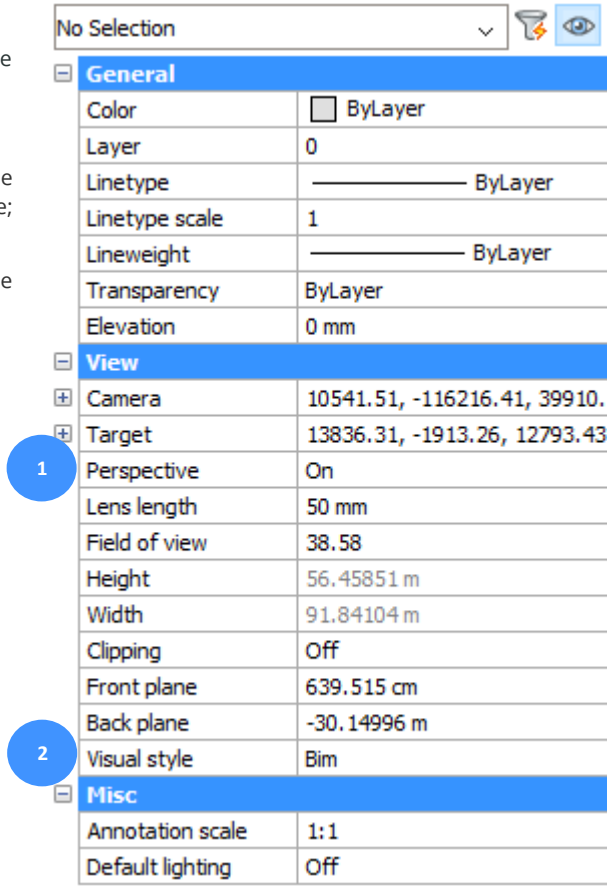
3. PLAN shows a horizontal section plane.
4. SECTION shows a vertical section that cuts through the model.
5. ELEVATION shows the exterior elevation view.



3.5 Properties Panel

Extra view settings can also be found in the **Properties Panel** while nothing is selected.

1. PERSPECTIVE: Reports the current value of the PERSPECTIVE system variable; switches perspective view mode on and off.
2. VISUAL STYLE: Reports the current visual style and allows you to select a different one.



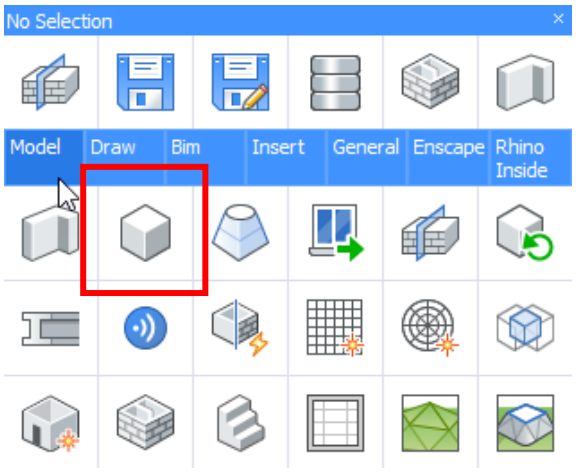
4 Selecting entities and Quad cursor

The following steps will demonstrate how to work with the Quad Cursor and highlight & select 3D model entities.

4.1 **File:** New, select **BIM mm template.** Note that the drawing units of this file will be in millimeters.

4.2 **Using the Quad**

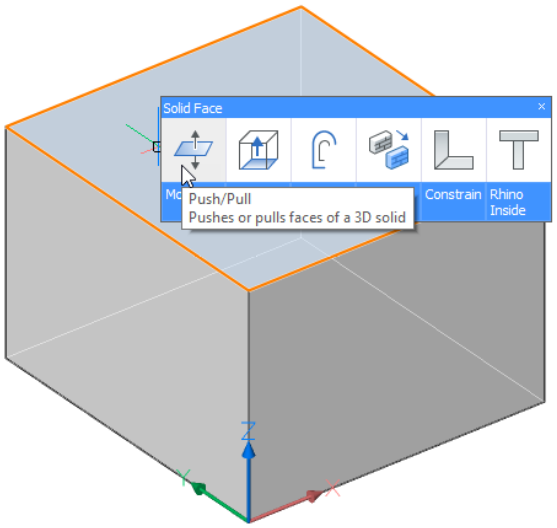
The quad is a floating toolbar that adjusts its content, depending on what you are or are not highlighting, and what you may have selected in the current workspace.



We'll start with an empty drawing.

1. Right-click in the model space. The quad appears in no selection state.
2. Move the cursor over the **Model** tab.

   The tool group is expanded with more tool options.
3. Click the **BOX** icon from the quad.
4. Draw a simple 3D box.
5. Hover the cursor over one of the faces of the box. The Quad displays a single icon, which is the most recently used tool with this entity type.
6. Right-click to launch the most recently used tool or move the cursor over the icon to further expand the Quad.



4.3 **Selection modes**

Selection modes allow you to control which sub-entities (faces, edges, and boundaries) should highlight in selection preview, and can be selected.

1. Selection modes can be found in the **Access toolbar** or by typing **SELECTIONMODES** in the command line.
2. Click the face and boundaries options.

Select edges is inactive whereas select faces and select boundaries are active

Enable detection of 3D solid edges	Controls whether 3D solid edges are highlighted by selection preview, and can be selected.
Enable detection of 3D solid faces	Controls whether 3D solid faces are highlighted by selection preview, and can be selected.
Enable boundary detection	Controls whether closed boundaries in XY-plane of the current coordinate system or on the face of 3D solids are detected.

4.4 Highlighting vs Selecting entities

When select Edges is off, select Faces and Boundary Detection are on (default), do one of the following:

1. Hover over the face with your mouse cursor

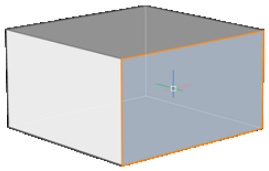
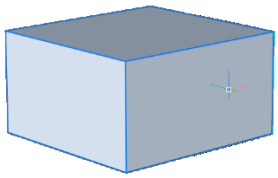
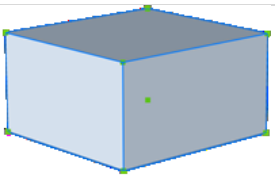
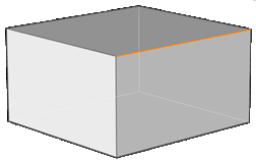
   The **solid face** is highlighted in orange. When the face is highlighted, click this face to select it.

2. Hover over one of the faces of the solid while holding down the **CTRL** key.

   The solid displays in blue. When the solid is highlighted, click the solid to select it.

3. Hover over the edge of the solid while holding down the **CTRL** key.

   The edge displays in blue. When the edge is highlighted, click the edge to select it.

Highlighted/Selected Face	
Highlighted Solid	
Selected Solid	
Highlighted/Selected Edge	

4.5 Selecting multiple entities with selection windows

The selection windows allow you to select one or more than one entity at a time.

There are two types of selection windows in BricsCAD;

Blue selection window: It appears when creating a window from left to right.

Green selection box: It appears when creating a box from right to left.

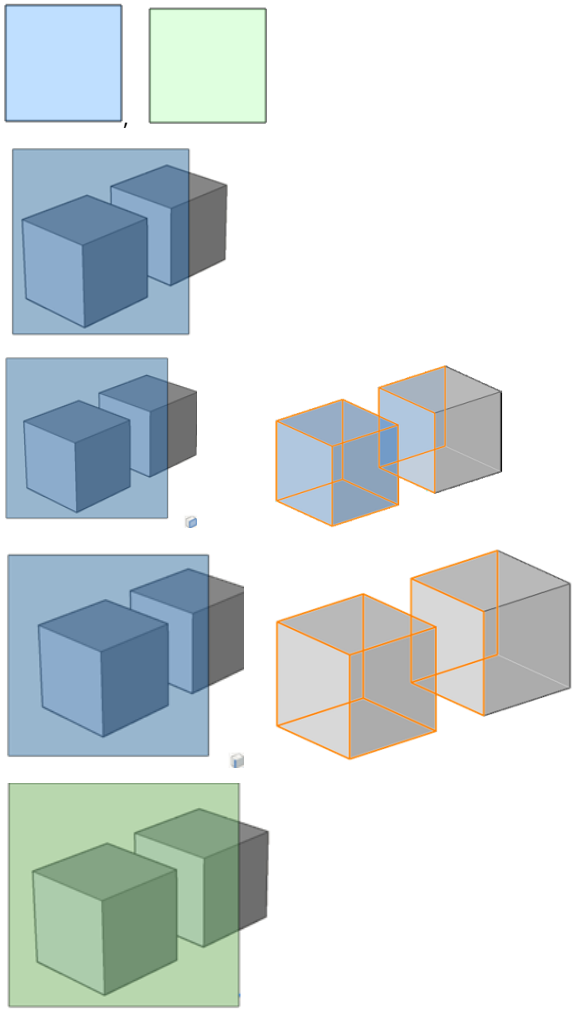
1. Click and move the mouse to the right to create a blue window around the box geometry you've created before. When the box is completely inside the window, it will be added to the selection set

NOTE: by default, selection window only selects entire entities (e.g. solids, lines, polylines, blocks...) but not sub-entities (e.g. solid faces, solid)

2. Press CTRL key once during window selection to select the **faces** of the 3D box.
3. Press CTRL key twice during window selection to select **edges** of the 3D box.
4. Click and move the mouse to the left to create a green window around the box geometry.

When the box overlaps the window or is completely inside the window, it will be added to the selection set.

To select faces or edges of the 3D box with the green selection box, follow the same process as the blue selection box.



Modeling

Creating the geometry of a model can be done in several ways. The main point to take away from this section is that no matter how you obtained the geometry, you can still use it later to add intelligence and data, and take it further in the BIM process. That is, as long as you're working with solids. Some possible ways to create the geometry are:

- Starting from an existing 2D layout, either by extruding objects upwards or by using Quickdraw
- Starting from some 3D mass model and 'sculpting' your way to a more detailed model
- Importing geometry from another file format such as .3dm or .stp
- Using the RhinoInside plugin in BricsCAD BIM to be able to run Grasshopper scripts directly inside BricsCAD
- ...

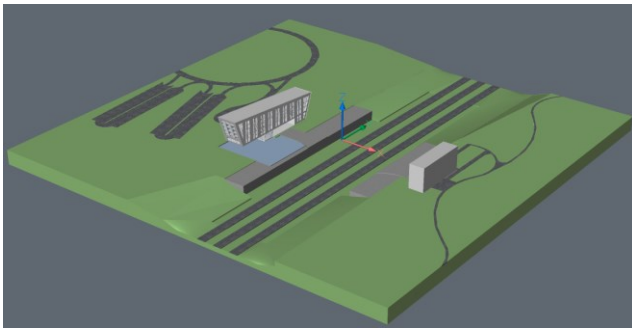
1 Importing geometry

The following steps will give an example of how to import geometry and how it can be used to enrich your BIM Model.

1.1 Open Overall.dwg.

You should see something like the image on the right. Hovering over the objects, you should notice that the drawing consists of three Xref's: one for each building volume and one for the site.

Also, note that one of the building volumes is currently just a box. We will turn this into an actual building later in the process.



1.2 Importing geometry

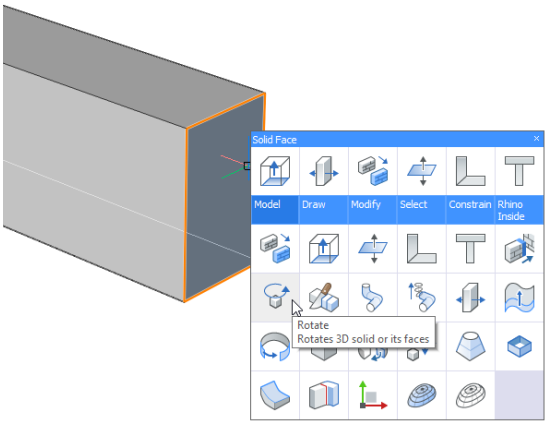
1. Click the Bricsys button next to the **Home** tab on the Ribbon and click **Import**, or type in the **IMPORT** command.
2. Select *Canopy.3dm* and click Open.
3. A large canopy structure should appear in between the two buildings. This canopy consists of solids, which means that the geometry can be used for further manipulation and information can be added to the geometry.

2 Sculpting a model

The following steps will give an example of how to turn a simple volume study into actual building geometry. You will learn some basic modeling tools along the way.

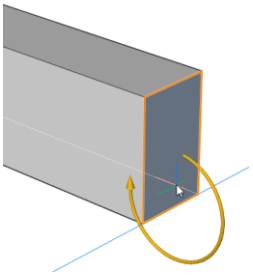
2.1 Manipulating the basic shape of an object

1. Hover your cursor over the building that looks like a box and in the Quad under **Modify**, click **OPEN XREF**  . Alternatively, open the **Attachments Panel**  , right-click **East** and click **Open**. If the Attachments Panel is not showing in your panel stack, right-click any empty space of the Ribbon and under Panels, enable *Attachments*.



2. Now you should be able to see the box in a separate drawing. We want to rotate some faces of the box to create a more interesting shape. To do this, make sure **Face Detection**  is enabled.

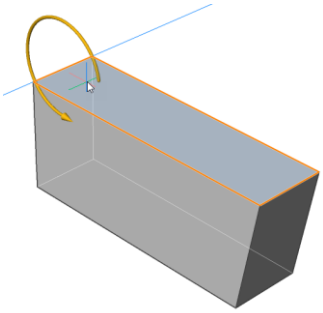
3. Hover over the end face of the box so that it is highlighted in orange, and in the Quad under the **Model** tab click **ROTATE**  .



4. A yellow widget appears that indicates the rotation direction and axis. Move your cursor close to the bottom edge of the face, until the widget 'rotates' around that edge.

5. Move your cursor to the right so that the face rotates 'outwards',

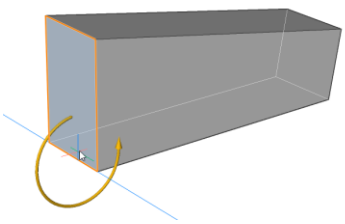
   type in **10** and hit **Enter**.



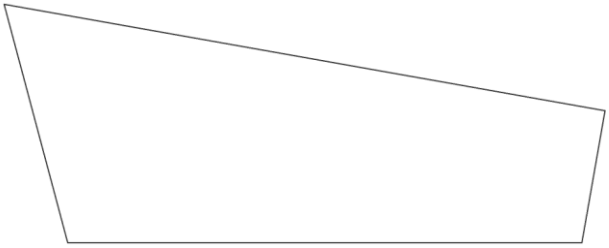
6. Do the same for the top face:

   rotate it **10** degrees downward around its **left** edge (see image).

7. Do the same for the opposite end face of the box: rotate it **15** degrees outward around its **bottom** edge (see image).



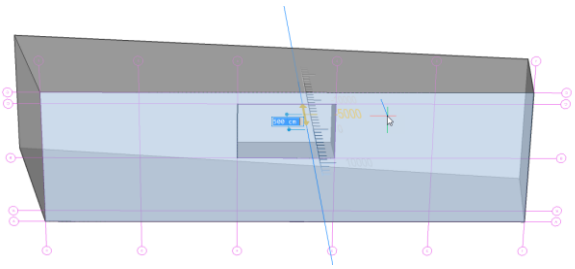
8. In the end, you should end up with a shape similar to the one shown in the final image (side view).

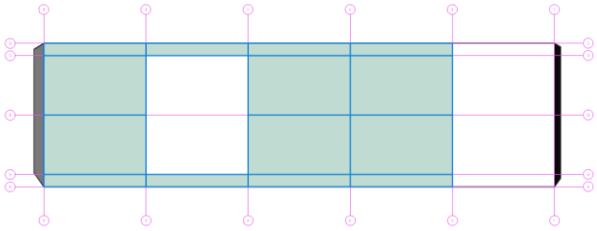


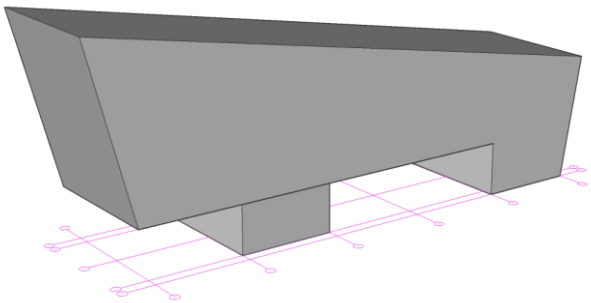
2.2 Using Push/Pull

We want to use some Push/Pull to create a more interesting shape. We want the shape to be similar to the one of the West Building (see Overall.dwg).

1. Rotate the camera so you can see the bottom side of the solid. We will be using the existing grid as a basis for what we want to Push/Pull.
2. Make sure **Boundary Detection** is enabled.
3. Move your cursor inside one of the grid cells and in the Quad under the **Model** tab, click **PUSH/PULL**
4. Notice that moving the cursor will either push this area inside the solid or pull it out. You can left-click to accept a value or type in a value and press Enter if you want to be more precise.
5. Undo the previous step; we want to Push/Pull multiple portions at once, so we will select them all at once.
6. Manually select the grid cells that are highlighted in the image on the right. If you accidentally select something else, use **Shift+left-click** do **deselect** that entity.
7. Once you have these grid cells selected, use **PUSH/PULL** and push these faces inward over a distance of **5500**. Thus, you should end up with something similar as shown in the final image.



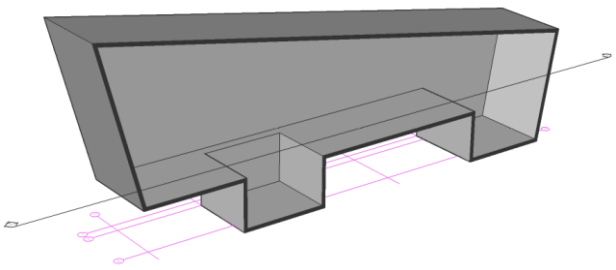




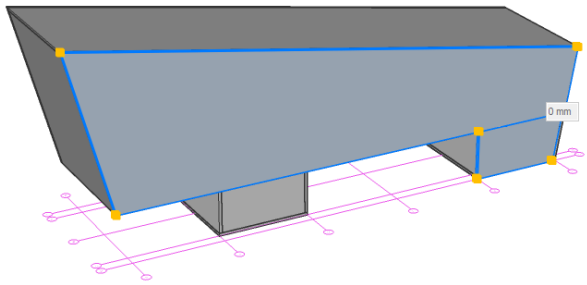
2.3 Using Shell

Currently, our building is still just a box: if we section through our building, we see that it is not hollow so no spaces can be made inside.

1. In the **Home** tab of the Ribbon, click **SECTION**. Hover the cursor over one of the side faces until it is highlighted in orange, and left-click. You should now be able to clip vertically through your model. Move the cursor inward so that you're clipping about halfway through the model, and left-click.
2. In the **Modeling** tab of the Ribbon, under **Solid Editing**, click **SOLIDEDIT > BODY > SHELL**.
3. Select the solid and press **Enter**.
4. When prompted the enter the shell offset distance, type in **300** and press **Enter.**
5. Hit **Enter** twice more to exit the solid editing command.



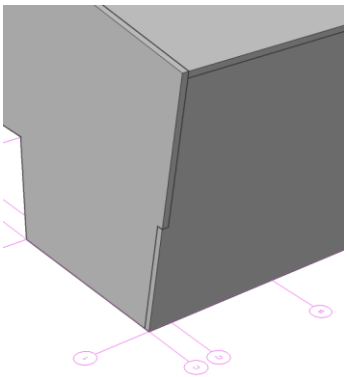
2.4 Splitting the model into separate pieces



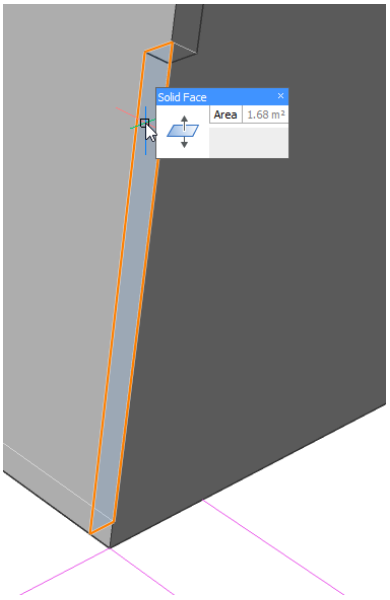
The solid is now hollow, but it still consists of 1 single object. In general, we want to split up the model so every object is a separate entity. Otherwise, you might run into problems when performing commands like Bimify or when assigning compositions. We can split up the model manually using tools like **Slice**, but in this case, we'll use an automatic way to do this.

1. Remove the section plane if you haven't done so already.
2. Highlight the **solid** (not one of the faces), and in the Quad under **Model** click **SPLIT**  . This command will try to assume how to split the model into separate solids.

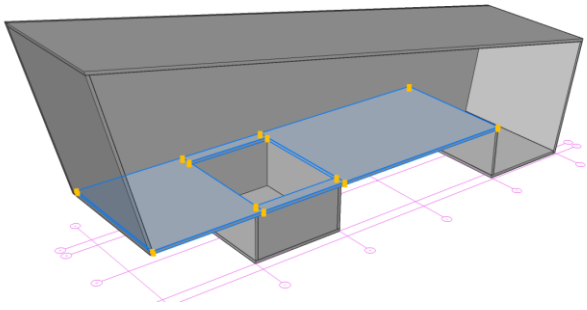
   Note: this works best on simple geometry.



3. We now have 18 solids. We need to clean up a bit after using **Split**, because it did not do exactly what we wanted. As we can see on the image on the right, the large sidewall (on either side) was also split into two pieces.
4. In the **Modeling** tab of the Ribbon, under **Solid Editing**, click **UNION**  and select the two side walls highlighted in the image.

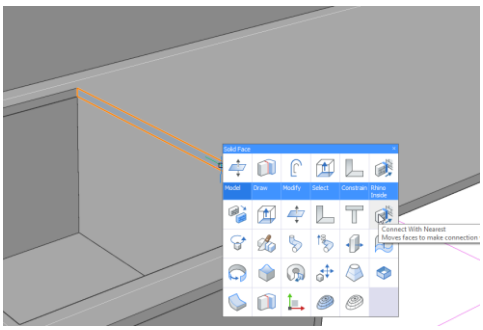


5. Do the same for the other side.
6. As we can see on the second image, now the way the sidewall and back wall come together is not uniform over the entire height of the building. We can fix this using Push/Pull.
7. Make sure **Face Detection**  is enabled. Hover over the edge and hit **Tab** a few times until the end face of the sidewall is highlighted (see image).
8. Use **PUSH/PULL**  on this side face and snap to any point on the back face. This should make the butted connection uniform over the entire height.
9. Do the same for the other side.
10. Highlight the side wall **solid** and in the Quad under **Select** tab, click **HIDE ENTITIES** 
11. Now that we can look inside, we see that the floor slab has a hole in it where the support structure is located, and the slab itself is split into 4 separate pieces.



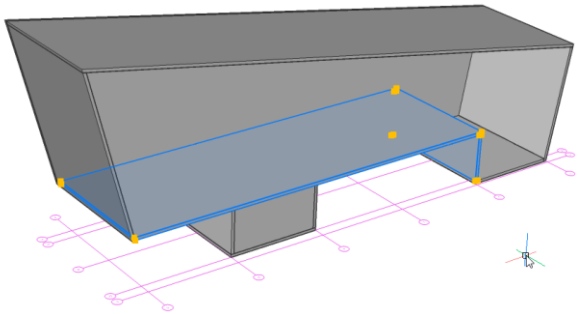
12. In the **Modeling** tab of the Ribbon, under **Solid Editing**, click **UNION**  and select the four parts of the floor slab, see image.

13. To remove the hole in the slab, highlight any of the inner faces of the hole (make sure **Face Detection** is enabled), and in the Quad under **Model**, click **CONNECT WITH NEAREST**



2.5 Creating some more interior walls and slabs

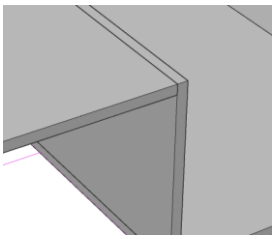
Let's change the connection between the upper floor slab and the wall highlighted in the image.



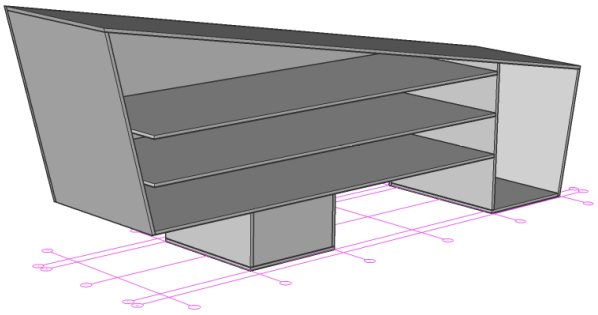
14. Select both solids as highlighted in the image, and in the Quad under **Model** tab, click **L-TYPE SOLIDS CONNECTION**

15. Hit the **Ctrl**-key a few times until the connection is shown as in the image, i.e. with the slab butted against the wall instead of resting on top of it. Press **Enter** to accept.

16. Highlight the top face of the wall (make sure **Face Detection** is enabled), and in the Quad under **Model**, click **CONNECT WITH NEAREST**. This should connect this wall with the roof slab, so we now have to separate rooms inside our building.



17. We can create some more interior floor slabs. We can do this by simply copying the existing upper floor slab in the Z-direction, or we could use the **BIM Copy** tool

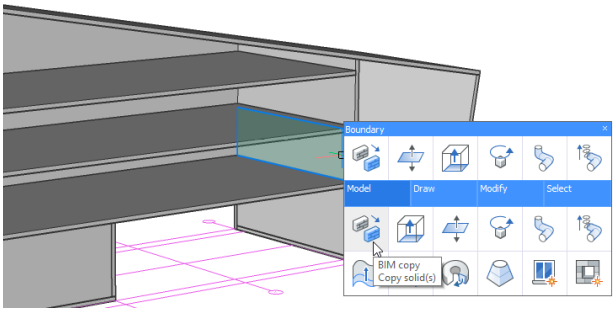


18. Highlight the top face of the upper floor slab and in the Quad under **Model** tab, click **BIM COPY**

19. Move the cursor upward, type in **4000** and hit **Enter**

20. Hit the **Ctrl**-key once so you go into 'repeated copy' mode; move your cursor until there are in total 3 slabs above each other. Press **Enter** to exit the command.

21. Notice that the two upper floor slabs are not connected to the slanted end wall. We can again use **CONNECT WITH NEAREST** on the end faces to solve this problem.



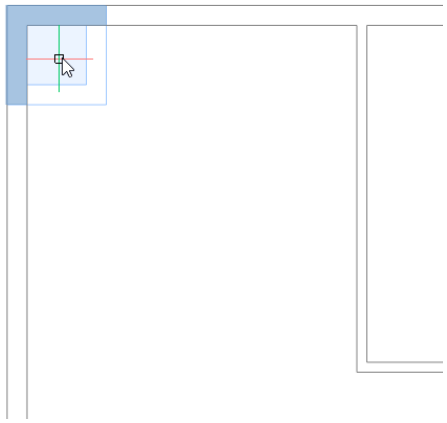
22. The **BIM Copy** tool can also be used on boundaries; Make sure **Boundary Detection** is enabled and hover the cursor over the boundary highlighted in the image. This way you can easily copy (parts of) walls and floor slabs around your mode.

3 Starting from a 2D Layout

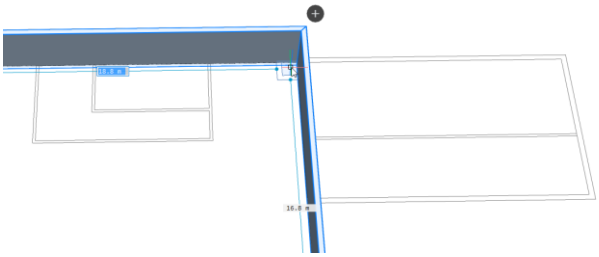
In this section, we'll create a building starting from a simple 2D layout, on the one hand using Quickdraw and on the other hand using more standard tools like Extrude.

3.1 Using Quickdraw to trace over an existing layout

1. Open **Office Building.dwg**.
2. Let's start with the layout that is drawn along the current UCS and that has simple rectangular spaces.
3. In the **Home** tab of the Ribbon, click QUICKDRAW  .
4. A special cursor appears, indicating the locations of the walls you will be creating.
5. Move the cursor close to one of the corners of the layout: you will see that it snaps to the lines. Position your cursor as shown in the image.



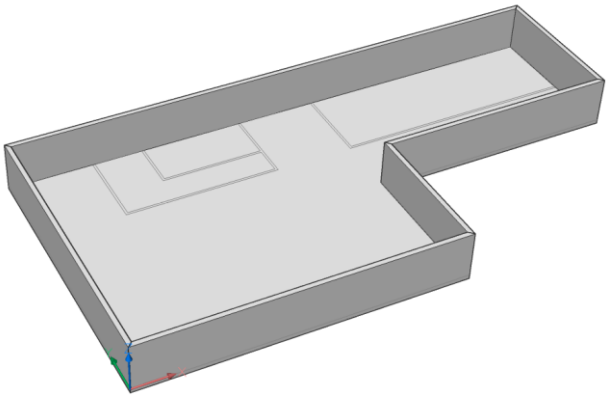
6. Left-click: you are now drawing the first room. Move your cursor to the opposite (bottom right-hand) corner of the layout and left-click again. If you now rotate the camera, you'll see that you created 4 walls and a slab.



7. We can expand this room into an L-shaped room by moving our cursor into the corner of the two walls highlighted in the image and left-clicking.

   Note that the walls you are snapping to are highlighted in blue.

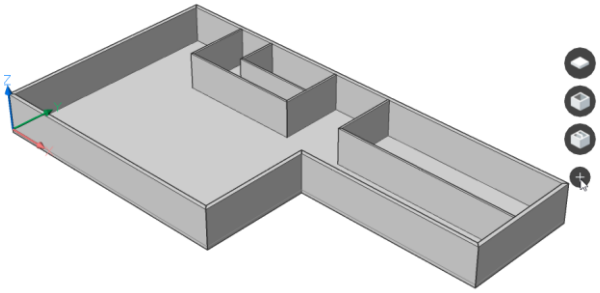
8. By moving the cursor to the right, you will see that a part of the right-hand wall becomes red. This means that we will be removing this part of the wall so that the room can be expanded into an L-shaped room.
9. Again, snap to the (other) bottom right-hand corner and left-click. You should now have an L-shaped room.



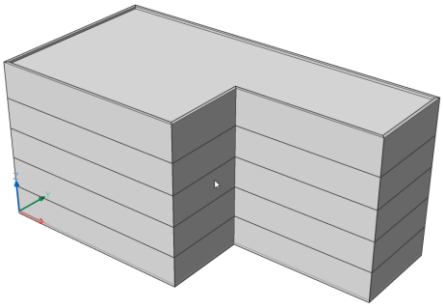
10. We can use these steps to trace the interior walls as well. Note that the cursor becomes 'thinner' as it snaps to these lines.
11. Continue using Quickdraw until all of the lines of this layout have been traced over, and you have every inner wall in place.
12. **Note** that Quickdraw uses default values for slab thickness, room height etc. These default values can be found and changed in the settings dialog.

13. Also **note** that this Quickdraw tool can be used in combination with direct modeling tools. For the sake of simplicity this section and the previous section were split up but it is perfectly possible to use hybrid methods.

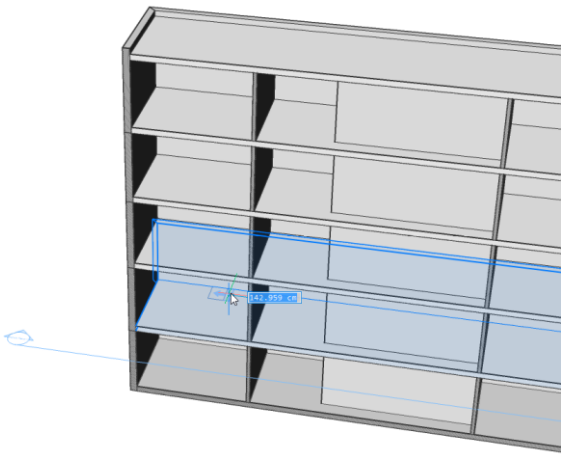
3.2 Copying floors using Quickdraw



1. Note that when Quickdraw is active, a little **'+'** icon is displayed next to the building. Clicking it gives you three options:
   - Copy an entire floor
   - Copy only the outer walls of the floor
   - Create a flat roof
2. Click the *copy entire floor* button four times so you have a total of 5 floors.
3. Finally, click the *create roof* button to finish the building envelope.

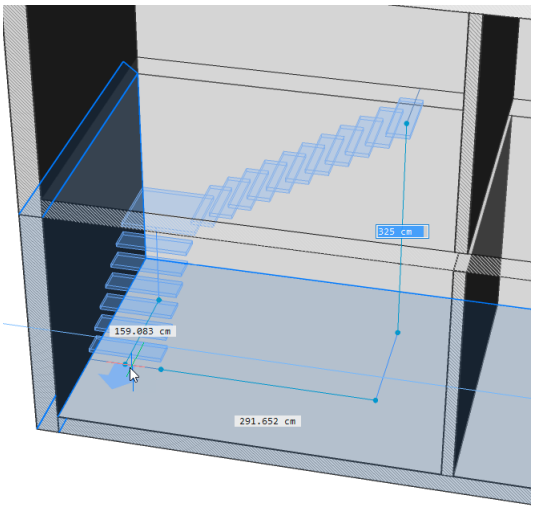


3.3 Creating stairs



Creating stairs can be done in several ways; again, direct modeling is an option. However, it's easier to use the dedicated stair tool.

1. Activate a vertical section so you can see inside the building.
2. In the **Home** tab of the Ribbon, click **STAIR** 
3. A special cursor appears, similar to the Quickdraw cursor. This time it shows the first tread and the direction of the stair. Hit the **Ctrl**-key to change the direction.
4. **Note** that the cursor snaps to existing slabs and walls. This allows for easy alignment with existing objects.
5. Move the cursor so that it snaps to the back wall and is going 'towards' the left wall, as shown in the image.
6. A live preview of the stair is shown as you move your cursor over the slab beneath it. You can make single-flight stairs, L-shaped stairs, and U-shaped stairs.
7. Move your cursor along the left wall so that an L-shaped stair is previewed;
8. **Note** that when the stair is created, automatically a hole is made in the upper slab. This is based on the **HEADROOM** setting. More default settings can be found in the settings dialog under BIM → General → Stair.
9. Select the stair and open the Properties Panel. Under Parameters, you can find and alter its geometric properties, such as stair width or step thickness.

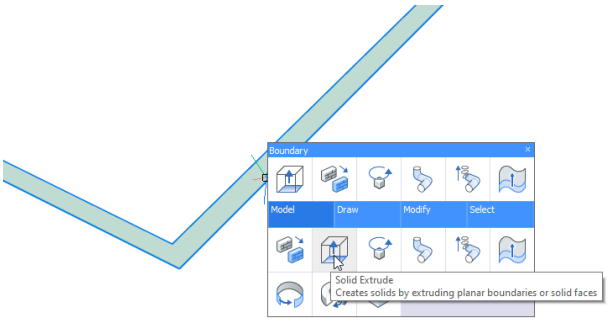


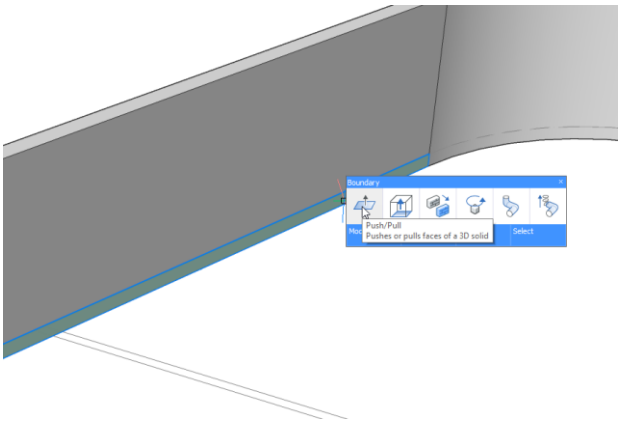
3.4 Starting from non-rectilinear layouts

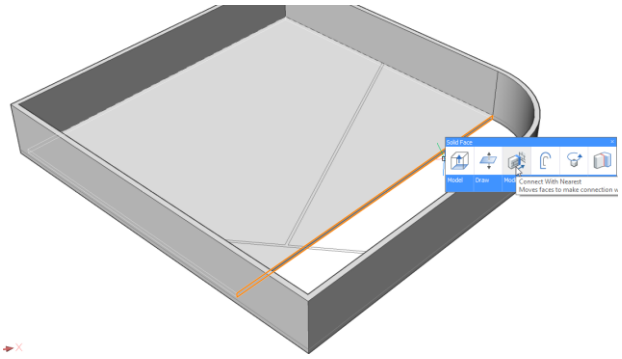
The previous example consisted of a rectilinear layout, aligned with the current UCS. The second example is not so simple: the outer walls are not aligned to the current UCS, the inner walls are not perpendicular and there is a cylindrical wall.

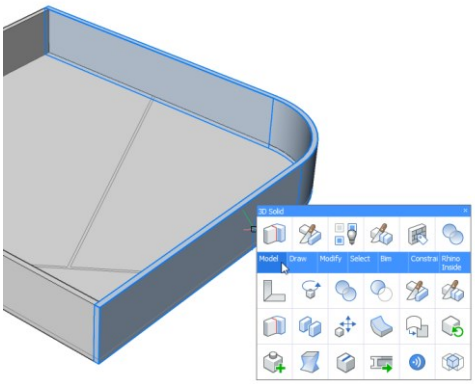
Since Quickdraw only works in the current UCS, it's not straightforward to use this tool for this particular situation.

1. Make sure **Boundary Detection** is enabled and move your cursor inside the two lines of the outer walls. The boundary should be highlighted in green.
2. In the Quad under **Model** tab, click **SOLID EXTRUDE** .
3. Move your cursor upward, enter a value of **3000** and press **Enter.**
4. Let's also **PUSH/PULL** the bottom face of the walls **down** over a distance of **250** mm so we can easily create a floor slab.
5. Now we can use the boundary between the lower edge of one of the walls and the layout lines to **SOLID EXTRUDE** the floor slab. You may need to construct **part** of the floor slab first and then use **CONNECT WITH NEAREST** so it connects properly with the cylindrical wall (see third image).
6. Currently the outer walls are all constructed as 1 solid; use **SPLIT** to split it up into separate pieces.
7. Notice that the walls were split up into three parts instead of five; the cylindrical wall was not taken into account when splitting. We can still split this up manually.
8. Highlight the **solid** of the wall (see fourth image) and in the Quad under **Model** tab, click **MULTISLICE** (careful: this icon look very similar to Slice by Object, which is less straightforward to use in this case).
9. Multislice asks for a **slicing plane**: choose the face of the wall perpendicular to this part of the wall (in the image: the wall in the bottom left-hand corner). A blue slicing plane should appear that indicated where you will slice the selected object.
10. Snap to the point where the **straight** wall and the **curved** wall come together, and left-click. Hit **Enter** to exit Multislice.

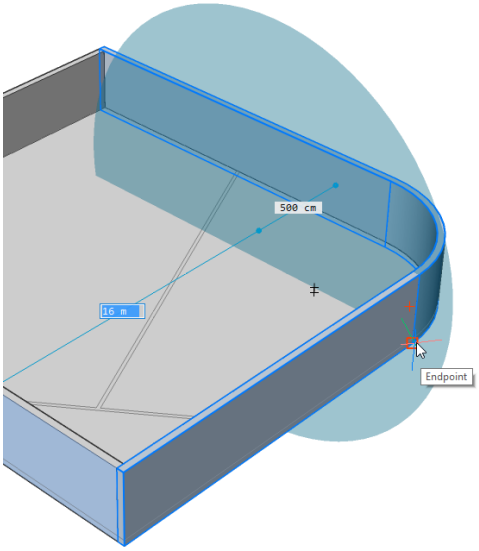








11. Do the same in the perpendicular direction for the other segment of the wall.
12. In total we should now have 5 walls: four straight walls and one cylindrical.
13. Make sure **Boundary Detection** is enabled and move your cursor inside the two lines of the interior walls. The boundary should be highlighted in green.
14. In the Quad under **Model** tab, click **SOLID EXTRUDE** .
15. Move your cursor upward, enter a value of **3000** and press **Enter**.
16. Now use **SPLIT** on these interior walls to split them into separate solids.
17. Now we can simply copy this floor up using **COPY** or using the Manipulator.

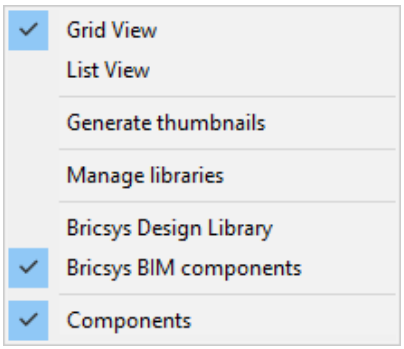


Components

You will learn to use the components panel, insert objects into your model, create a simple non-parametric window and create windows and curtain walls on the fly.

1 Inserting components

1.1 Using the Components Panel



1. Open **East.dwg** in the Components folder.
2. On the right-hand side of your screen, open the Components Panel  . It should contain several categories such as Windows and Doors. If it does not, click the little menu icon in the top right corner and enable *Bricsys BIM Components*.
3. **Note:** aside from the BIM components also the so-called *Bricsys Design Library* is delivered with the product. This library contains components used in mechanical design, such as standard parts and sheet metal features.
4. The BIM components and Design Library are saved under *C:\Program Files\Bricsys\BricsCAD V20 en_US\UserDataCache\Support\en_US*.
5. On Windows, when creating custom components these will be saved under *C:\ProgramData\Bricsys\Support\Bim\Components*, or whichever path is specified in the COMPONENTSPATH variable which can be found in the settings dialog.

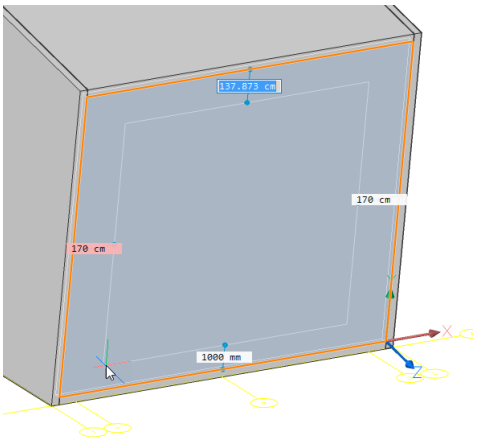
   For Mac open the Finder, go to the Go tab and click on 'Go to folder...' and type in *var/Bricsys/Components*.
6. Left-clicking a category will open it. Left-clicking a component will allow you to insert it.
7. **Note:** when inserting a component the command **BMINSERT** is launched. Thus, if you want to insert a component that is not in your library, you can always manually call **BMINSERT** or click the Insert Component  icon on the ribbon or Quad.

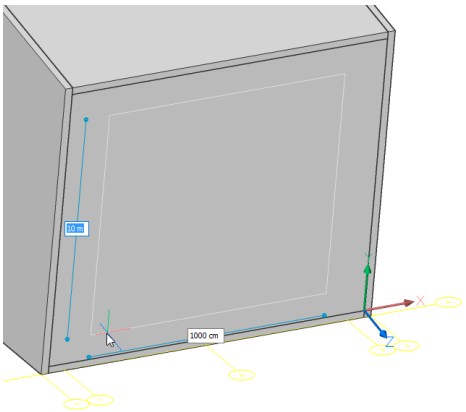
1.2 Inserting a window

Let's insert a library window into one of the walls.

1. Make sure the Dynamic UCS (DUCS) and Dynamic Input (DYN) are enabled. This can be toggled on in the status bar, at the bottom right of your screen.

2. In the components panel, browse to the Windows category
3. Left-click the **Window 1x1** component
4. Automatically the properties panel is opened and the properties of the window are shown. Here you can change its geometric parameters such as Width, Height or GlazingDepth. Change the Width and Height both to **10000 mm**.
5. Move your cursor over the back wall of the building. The outline of the window is displayed, and dynamic inputs are displayed indicating the distances to the edges of the wall.
6. Enter a value in the dynamic dimension field that is highlighted (e.g. **1700**), and press **Tab** to jump to the next dimension. The one you entered is now locked and displayed in red. Using this technique you can accurately position the window in the wall.
7. While still placing the window, press **Ctrl** once. Now the dynamic input fields change from 'positioning' to 'dimensions': you can now still edit the width and height of the window while placing it. Again you can press **Tab** to toggle between width and height.
8. To go back to 'positioning' dynamic inputs, press **Ctrl** again.
9. To finally place the window, press **Enter** or **left-click**.
10. **Note:** If you highlight this window and in the Quad under **Model** tab click **BIMINSERT** you will be able to copy this exact window (including its new parameter values) over to other locations in your drawing.



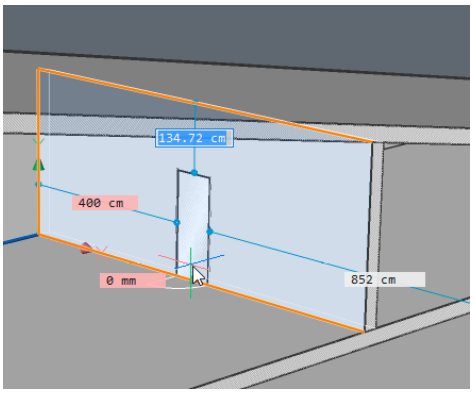


1.3 Editing an existing window

1. Select the window that you just inserted.
2. Open the Properties Panel
3. Here you can find several properties of the window, such as for example IFC Common properties. Also the geometric parameters that you saw before are visible here.
4. Change some of the parameter values and see what happens to the model.

Parameters	
W	1000 cm
H	1000 cm
Rebate	0 mm
PlacementDepth	0 mm
LiningThickness	60 mm
LiningDepth	250 mm
GlazingDepth	20 mm
GlazingOffset	100 mm

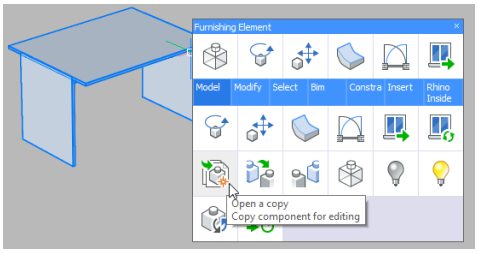
1.4 Inserting other types of components



These same steps apply for inserting other types of components as well, for example furnishing elements.

1. Activate the vertical section plane so you clip through the building
2. Try inserting some furniture into the drawing using these same steps.
3. Insert a door in one of the interior walls of the building.
4. Note that the door displays a swing line. If you want the door to have a different orientation, highlight it and in the Quad under **Model** tab, click either of the **BIMFLIP** icons: 

1.5 Customizing a library object



If you want to alter an object beyond its geometric parameters (e.g. add extra geometry, change the materials…) you can use the following steps.

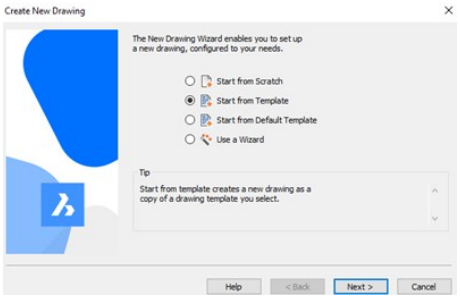
1. Insert the object you wish to alter in your drawing
2. Hover your cursor over the component and in the Quad under **Model** tab click **OPEN COPY** 
3. Make the modifications you want
4. In the Components Panel, click the **Create Component** button. See also next section for a more detailed explanation on making custom components.

2 Creating a custom component

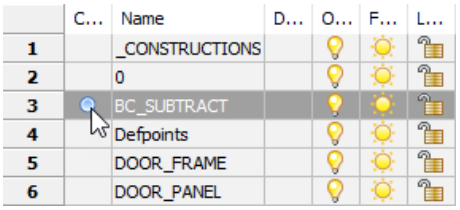
In this section we will create a custom window component. Note that this window will **not** be parametric; this is a more advanced topic that will be covered later.

2.1 **File: New Wizard,** choose **Start from Template** and click **Next**, choose **BIM-Window-metric.dwt**. Uncheck the box that says '*Use the selected template as default*' and click **Finish.**

This template already contains some predefined layers such as BC_SUBTRACT or WINDOW_FRAME.



2.2 **Change current layer to 'BC_SUBTRACT'.** Layers can be found in the Layers panel on the right-hand side  .

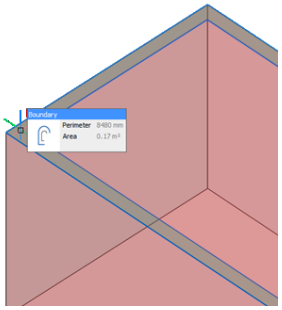


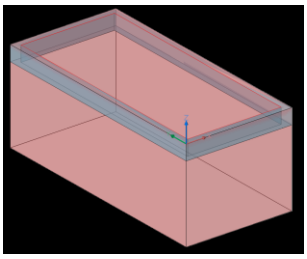
2.3 **Let's create the Subtractor Solid. This is the volume that will be cut away from the wall in which the window is inserted:**

1. Select **BOX** icon  or type **BOX** in the command line.
2. To start, type **0,0,0** and enter.
3. Move cursor towards upper right (i.e. first quadrant of the XY-plane). Type **1500** in highlighted cell, and press **Tab.**
4. Type **700** in highlighted cell, and press **Enter.**
5. Move cursor downward (negative Z-direction).
6. Type **600** in highlighted cell, and press **Enter.** The depth of this solid doesn't matter much, as long as it's thicker than the walls you will be inserting it in.

2.4 Create a window frame

1. Change current layer to **'WINDOW_FRAME'**.
2. Highlight **top surface** boundary of box.
3. Quad select **OFFSET**  in the **Draw** tab.
4. Move cursor towards center.
5. Enter **40** + **enter** (polyline created).
6. Zoom in so cursor is fully within 40 mm boundary, so boundary is highlighted (see figure).
7. Quad select **SOLID EXTRUDE**  .
8. Move cursor downward, and press **Ctrl** once so you enter *'Create mode'* instead of *'Auto mode'*, which in this case will subtract. Input **100** and press **Enter**.





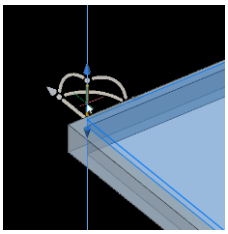
2.5 Turn off 'BIM_SUBTRACT' layer by clicking the lightbulb next to the layer nameand make 'GLASS' layer current.

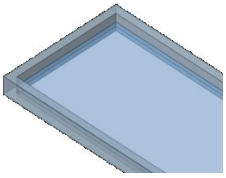
2.6 Create window glazing

1. Highlight boundary inside window.
2. Quad select **SOLID EXTRUDE**  .
3. Move cursor upward.
4. Input **25** + enter.

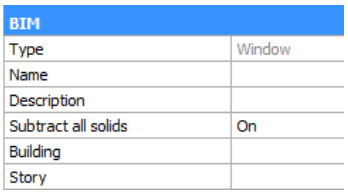
2.7 Move window glazing

1. Select the window glazing **solid.** While doing so, hold down the left mouse button slightly longer. This should make the **Manipulator** appear, a yellow cursor that allows you to easily move, rotate, copy and mirror entities.
2. Click the vertical bar of the Manipulator as shown in the image. This should make sure you move the object vertically upwards or downwards.
3. Move your cursor down, enter **75** and press **Enter.**



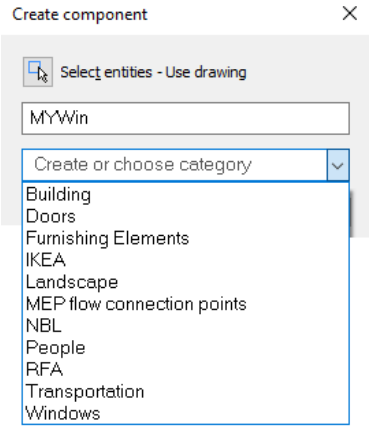


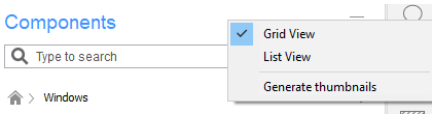
2.8 Classify as Window



1. Currently, this drawing is just a bunch of solids. We can classify the drawing as a Window so that upon insertion in another drawing, a Window object is inserted instead of just a 'dumb' block reference.
2. Make sure you have *nothing* selected by pressing **Esc**.
3. Launch the **BIMCLASSIFY** command.
4. Enter **'I'** for **wIndow** and press **Enter**.
5. Press **Enter** again to classify the entire drawing.
6. If you now open the Properties Panel on the right-hand side of your screen, you will see a new tab with BIM properties. The properties you fill in here will also be displayed after inserting this window into another drawing.

2.9 Creating the component





1. Open the Components Panel .
2. Browse to the folder where you want to save this component (Windows in this case).
3. Click the **Create Component** button at the bottom of this panel.
4. A dialog box displays.
5. Specify the component name (e.g. **MyWin1**) using the' Component name' box.
6. Choose the **Windows** category in the drop-down list.
7. Press **OK** to include the entire drawing in the newly created component.
8. **Note:** If the window is not displayed in the components panel click the right-hand side menu button and select the Generate thumbnail option in the fly-out menu.
9. Now this window can be inserted into walls like you would insert any other component. If you don't wish to save this object into the library, you can just save it anywhere on your system and insert it using the **BMINSERT** command.

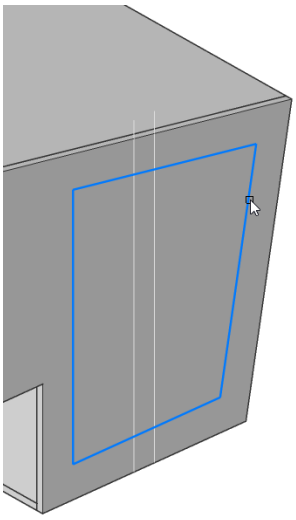
3 Alternative methods of creating windows

In this section we will create a custom window component. **Note** that this window will **not** be parametric; this is a more advanced topic that will be covered later.

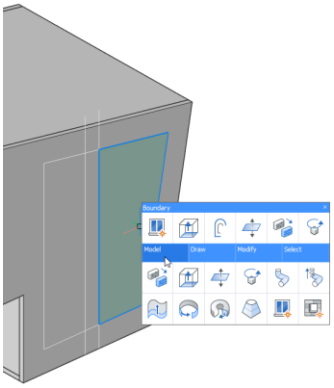
3.1 Using BimWindowCreate on a polyline and a boundary

BIMWINDOWCREATE lets you create window components with custom geometry on the fly without the need to predefine a window or fiddle with existing ones. This command allows three types of input geometry:

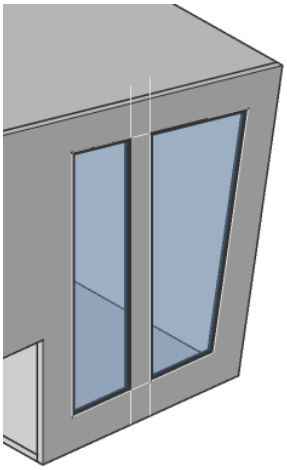
- Closed boundary on any solid face
- Closed polyline
- Grid



1. Go back to **East.dwg.** On one of the sides of the building a trapezoid and two lines were already drawn. We can use this as input geometry to create windows.
2. From the ribbon under the **Modeling** tab, click **CREATE WINDOW**  .
3. As input geometry, click the polyline highlighted in the image on the right and press **Enter**.

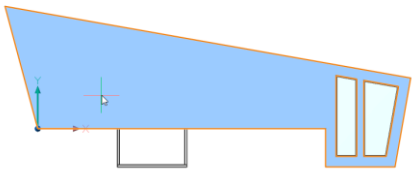


4. A dialog box appears allowing you to choose the style of the window. Let's select the top left one.
5. A window is created in the shape of this polyline. Select the window and open the properties panel. You should be able to alter its properties such as *Frame Thickness* and *Frame Depth*.
6. **Undo** until before the window was created.
7. Now let's use a boundary to create a window. Make sure boundary detection is enabled: 
8. Move your cursor inside the polyline; a boundary should be highlighted as shown in the image on the right.



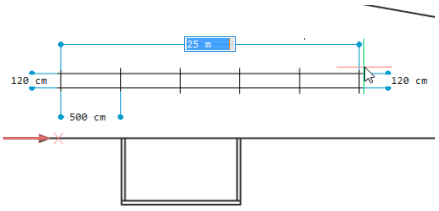
9. In the Quad under **Model** tab, click **CREATE WINDOW**  .
10. Again a dialog box is displayed. Choose a window style.
11. Do the same for the other portion inside the polyline so that you have two windows as shown in the final image.
12. **Note:** It's also possible to select multiple polylines or boundaries before using BimWindowCreate, this way you can create multiple windows at once.

3.2 Using BimWindowCreate on a grid

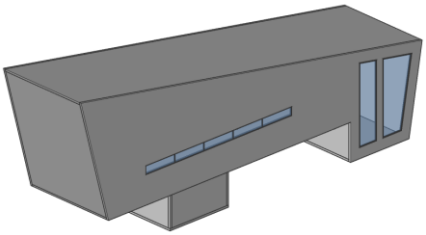


It's possible to use grids as input geometry for window creation.

1. Let's create a temporary grid on one of the façades. Using the LookFrom widget on the top-right corner of your screen, click the **Back** position so that you have a side view of the building.
2. Let's create a temporary grid on one of the façades. From the ribbon under the **Modeling > Create** tab, click the **RECTANGULAR GRID** icon  .
3. Move your cursor on the side façade of the building. Make sure your UCS is pointing the right way up (X-axis horizontal, Y-axis vertical) and hit the **Shift** key once to lock this plane, see image on the right.

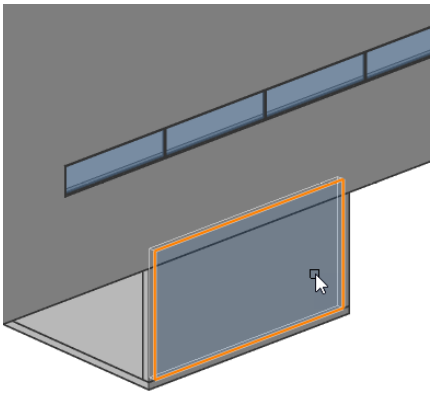


4. Left-click anywhere on this face to start creating the grid. Move your cursor outwards until you see multiple grid cells appear
5. Four dynamic input fields are displayed: two for the individual grid cell sizes (X and Y direction) and two for the overall grid size (X and Y direction). Hit **Tab** until the dynamic input field is highlighted that governs the **vertical dimension of one grid cell**. Type in **1200** and hit **Tab.**



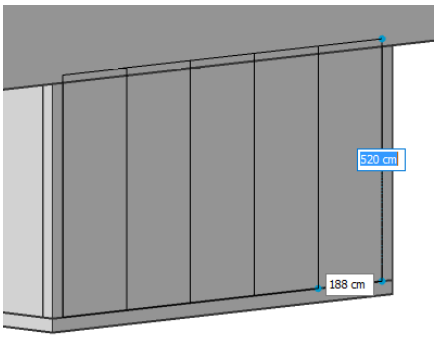
6. Move your cursor until you have grid of 5 by 1 cells, in total a grid of **25 meters by 120 cm**, and left-click. The grid is now created (**Note:** automatically grid labels are created)
7. (Optional) you can now still make modifications on the grid by using the **BEDIT** tool.
8. Highlight the grid and in the Quad under **Model** tab, click **CREATE WINDOW** 

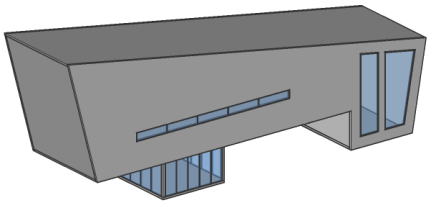
3.3 Using the Curtainwall tool



1. In the ribbon under the **Modeling** tab, click the **CURTAIN WALL** icon 
2. Select one of the side faces of the small box underneath the building
3. Automatically a first grid is laid out on this face. You can use the dynamic input fields to give an approximation of how wide and high you want the grid cells to be. Alternatively, you can use the command prompts to enter the number of panels in both directions.
4. Type in **NU** and press **Enter**. Type in **1** and press **Enter**.
5. Type in **NV** and press **Enter**. Type in **5** and press **Enter**.

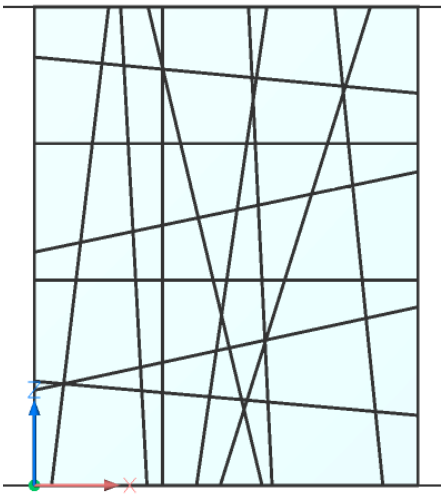
6. Once you are happy with the sizes of your panels, press **Enter** again.
7. At this stage it is possible to change the Frame Width, *Frame Depth, Glass Thickness* and *Connections Type.* To see what the different connection types are, please refer to the article on Curtain Walls on help.bricsys.com.
8. Press **Enter** to create the curtain wall.
9. Repeat the process for the other sides.



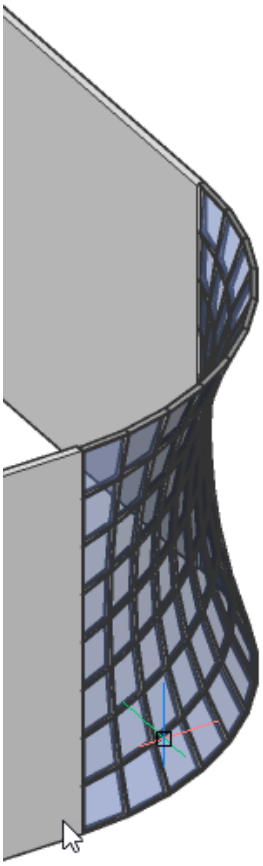


3.4 Some more advanced glazing

1. Open **Curtainwall.dwg** in the Components folder.
2. Select the grid that is drawn on the face of the large straight wall. **Note:** this grid was created by using the rectangular grid tool as shown before, and using **BEDIT.** The different grid axes were randomly rotated and shifted to generate a random pattern.
3. In the Quad under **Model** tab, click **CREATE WINDOW** 
4. In the ribbon under the **Modeling** tab, click the **CURTAIN WALL** icon 
5. Click the face of the lofted surface in between the two perpendicular walls. **Note:** this surface was created by using the **LOFT** command on three arcs.
6. Choose a proper panel size so that the glazing still looks smooth enough. Try **1500 x 1500** cells, and press **Enter**.
7. You are now asked whether to Planarize the cells. In the previous example you were not asked because it was already a planar face. Whether to planarize or not depends on the type of surface you are using. Generally planarizing can be useful as it tends to simplify the geometry. However, in the case of twisted surfaces this may not lead to satisfactory results.
8. In this case, we will choose **not** to planarize. Type in **N** and press **Enter**.
9. Change the Frame Depth to **150** and the Connection type to **Smooth**. Press **Enter** to accept.



10. A smooth glazing façade should now be created in the shape of the lofted surface.



Adding BIM data

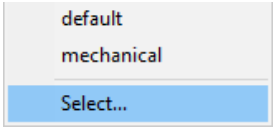
This module explains the different methods to add more BIM data into your BIM model.

1 Structure Browser and Classifications

1. Open **'Main Building_Start.dwg'** from the Adding BIM data folder.
2. First, let's get started with the **Structure Browser.**
3. Open the **STRUCTURE BROWSER** from the Tool panel at the left-hand side.

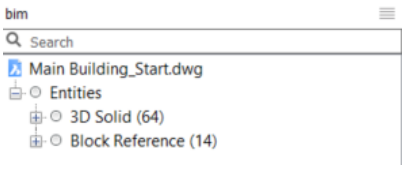
   The structure browser is an interactive tree that displays all the entities in the current model.

   The **tree structure** of the Structure browser represents the hierarchical set of rules in a graphical form. Each rule has a filter property, a grouping property, and a sorting property. Organizing the properties in the Structure Browser enhances the performance of your project while querying the entities among others.
4. Make sure the default **bim.cst** configuration file is active. You should see something similar to the image on the right. Using the configurable structure tree on the Structure Browser the BIM model can be organized in a way that you want to view the elements. Once you configured the tree, you can easily save this structured tree as a .cst file. By default, the .cst files are stored in the **Support Folder**.



5. If it is not, at the top of the structure tree click the little hamburger menu.
6. Choose **bim** from the drop-down list.
7. There 64 Solids and 14 Block References in this drawing.

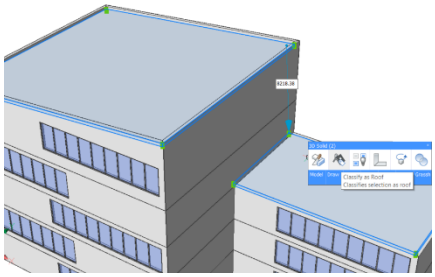
Note: When you use smart modeling tools like Quickdraw, WindowCreate, BimStair, Propagate, etc to create your model, it will already automatically classify your model into different BIM classifications and spatial locations.



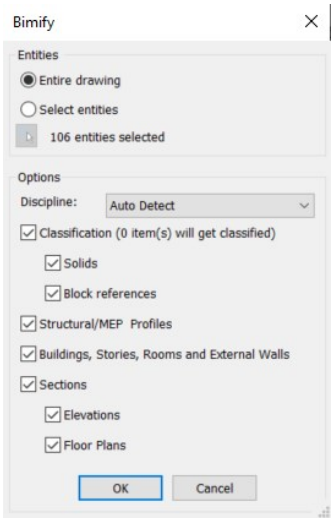
2 Bimify

1. Select the two top slabs and use **BIM: CLASSIFY AS ROOF** from the Quad. Now you have two Roof elements in your drawing.

   Note: In **Structure browser,** it has shifted to **Building Elements: Roof**



2. Classifying elements can be done manually, or automatically using **BIMIFY**. If any solids remained unclassified, BIMIFY will take care of them. Bimify will also add elevations and floor sections.
3. In the Ribbon under the Classify button, open **BIMIFY ADVANCED**: here you can choose options to use in your BIM model by ticking the boxes.



In the Bimify dialog, you have the option to scan the entire drawing, or just scan selected entities in the drawing.

Bimify can automatically detect whether a model is an Architectural, Structural or MEP model. BricCAD uses this information during the autoclassification process. Define this information before you launch Bimify, to improve the accuracy of the automatic classification.

Classification enables us to classify 3D Solids and Block References automatically.

Checking the **Structural/MEP Profiles** box allows us to automatically assign column, beam, member or flow segment profiles. If their profiles match a definition in the profile library, the profile name will be automatically added to the entity's properties as meta-data. If no matching profile definition is found, a new one is created in the library.

Buildings, Stories, Rooms and External Walls enables to assign spatial locations, create rooms and identify whether walls are external or internal.

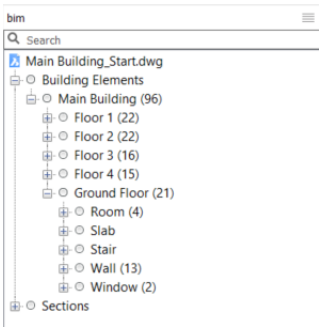
Sections allows to create automatic elevations and floor plan section planes.

4. Press **OK** to use all the options.
5. Expand Building Elements in the **Structure Browser**: All the 3D solids in the model are divided in different sorts of building elements. Select one in the structure browser, and one in your model, to show the link between model and structure browser and the ability to quickly select solids.
6. Rooms, Elevations and floor sections have also been added to the model.

3 Structure Browser and Spatial Locations

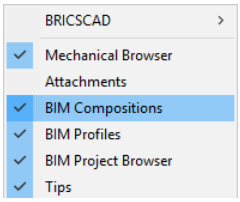
The spatial locations allow you to specify a building and its stories in a project. In BricsCAD, a BIM model file can contain one site and multiple buildings and a building can contain multiple stories. When the entities are classified as a building element in the project, these classified entities will have a **Building** and a **Story** property. Every building element in the BIM model resides in a particular story within a particular building.

1. Quad select **SPATIAL LOCATIONS**  (Quad: **BIM** tab).
2. You should see one building. Rename it to **Main Building**.
3. Inside this building should be 5 levels. Rename 'Floor 0' to **Ground Floor.**

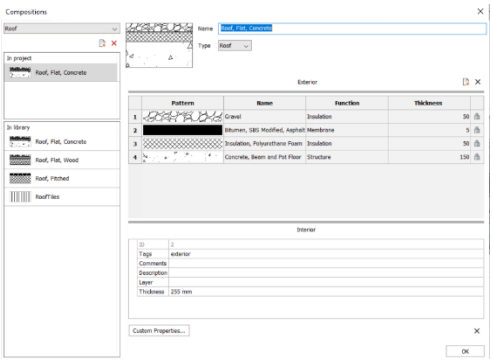


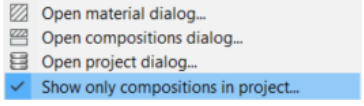
4 BIM Compositions

To further add BIM data to our drawing, you can add **Compositions** to the entities of the model. They can be either multiple plies or single-ply. In BricsCAD, predefined compositions of each building element type are stored in the library database.



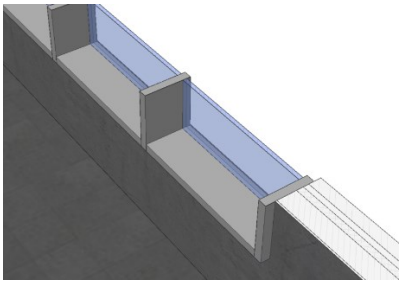
1. Open the **BIM Compositions Panel**  on the right-hand side of your screen. If the panel is not shown, right-click a blank menu area and select **BIM Compositions**.
2. It should appear with an icon in the Tool Panel. If it appears as a standalone, drag it over Tool Panel and position cursor until the large rectangle turns blue and release.
3. Use the search button to find **Roof, Flat, Concrete.**
4. (Optional) Double click to open the Composition dialog to edit the composition plies.
5. Drag and drop this roof type onto the Roof.
6. You are prompted to select a reference face. The top face is highlighted by default, you can change it by clicking this icon:  .
7. The selected face (reference face) will stay in the same position while the other face will shift if the wall needs to get thicker or thinner.
8. In this case, you need the reference face to be the top face. If not, you should flip it and press Enter. The composition is now applied to the roof.





9. Make sure **LEVEL OF DETAIL** is toggled **ON**. Level of Detail (LOD) allows to switch between a visual representation with and without plies and render materials.
10. Turn **ON** clipping of the top **Floor Plan section (Floor 4)** by using **CLIPDISPLAY** or by double-clicking.
11. Click on the dropdown menu of the Compositions panel and choose **Show only compositions in project…**
12. Drag and drop the compositions to the following:
    One back wall: **Cavity Wall, Back**
    Two front walls: **Cavity Wall, Front**
    One interior wall: **Interior Wall Plaster**
    One floor slab: **Floor, Concrete, Insulated**
13. Press **Enter** to accept the default faces.

5 Parametric Components

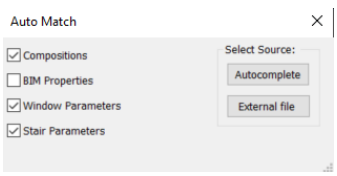


1. Zoom into the window on the top floor.
2. This window is created with **WINDOWCREATE**, which means this window has parameters to change the dimensions of the component.
3. Select the window.
4. Open the **Properties Panel** and scroll to Parameters section.
5. Change **FrameDepth** parameter from 60mm to **350mm**.
6. Zoom out and close the section plane.

6 Automatch

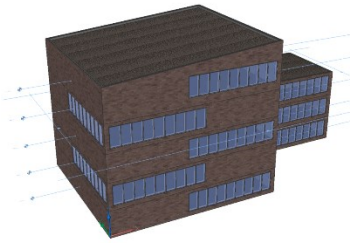
Automatch matches the composition, properties or parameters of example entities to all similar entities in your project. **BimAutoMatch** finds similarities based on the type of element, interior/exterior property, orientation, spatial location, number of windows in a wall and already defined properties. It will not overwrite already defined properties, unless no unmodified entity can be found, and the user specifies a source entity.

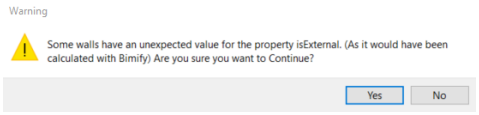
1. Launch **AUTOMATCH** in the ribbon.
2. The AutoMatch dialog pops up and checks the options you want to be Autocompleted.
3. Since we added compositions and changed some parameters of the window component, let's check **Compositions** and **Window Parameters**.

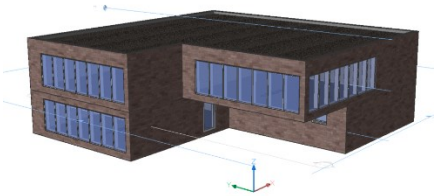


This command will also work if you changed properties from entities and stair parameters.

4. Click **Autocomplete** to finish.
5. Open the floor section of **Floor 0** to check the compositions and parameters.
6. **SAVE** this drawing.
7. Open **'SecondBuilding.dwg'**
8. We want to apply the same style and the same window parameters to this drawing.
9. Launch **AUTOMATCH** in the ribbon.
10. Check **OFF Stair Parameters** and Click **External File**.
    This is a convenient option when you have similar style buildings in other drawings or projects, where you want to apply a similar style (properties, parameters and compositions) to.
11. Choose the **'Main Building_Start.dwg'** you have just saved.
12. A warning sign might pop up, just click on **Yes** to let Automatch work on the second building.
13. **SAVE** the second building drawing.



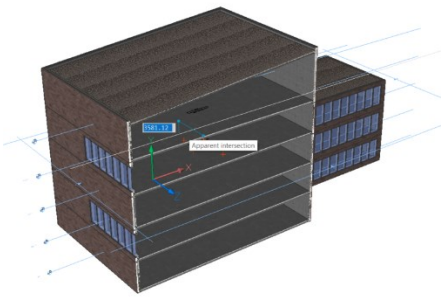


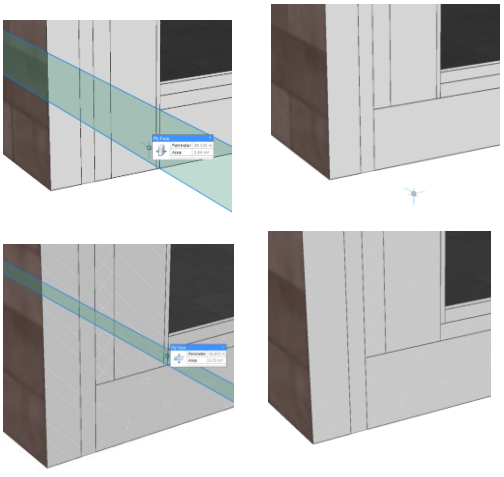


7 Composition Plies

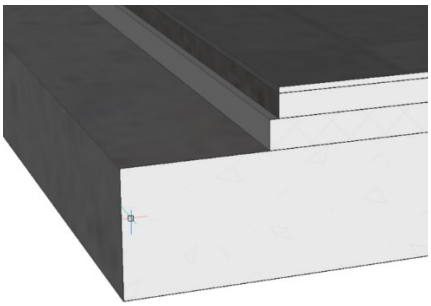
To further add more detail and information in your drawing, let's increase the LevelOfDetail (LOD) by editing the plies of the compositions.

1. Open **'Main Building.dwg'**
2. Create a **BIMSECTION** in the ribbon or Quad select in Model tab.
3. Select the front face of the building to define the direction of the section.
4. Type in **2000mm** to define the distance of the section.
5. Zoom in to the connection between the bottom floor slab and exterior wall.
6. Since you will be editing the plies of the compositions, **Selection of faces should be ON** in the ribbon or **SELECTIONMODES** should be **value 2**.
7. Hover cursor near the concrete surface of the floor slab, and press **Tab** until the Ply Face of the Concrete ply is highlighted.
8. Quad select **PUSH/PULL** and move it to the insulation layer of the wall (like the image on the right).



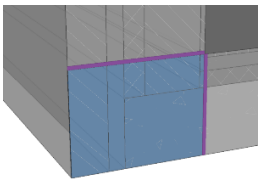


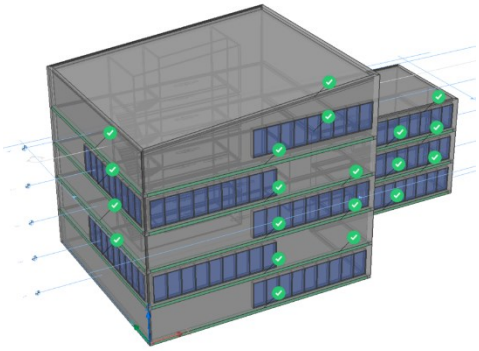
9. Do the same for the floor screed layer, until it looks like the right images.
10. You can check the change in the geometry of the floor slab.
11. Selection of faces can be turned **OFF** in the ribbon or **SELECTIONMODES** should be **value 0**.
12. Highlight floor solid.
13. Quad select **ISOLATE ENTITIES** 
14. The floor geometry is isolated, and you should see the form changes that you just made.
15. Quad Select **SHOW ENTITIES** 



8 Automatically copying details with BIMPROPAGATE

BimPropagatePlanar is one of the five Propagate options in BricsCAD BIM. It can be used to copy detailed connections between two or more planar entities. Propagate will search for similar situations in the drawing where the connection can be applied to. Common examples are wall-slab connections or wall-wall connections.





1. Toolbar select **BIMPROPAGATE PLANAR**  (Quad: **Model** tab).
2. Select the floor and wall that have been edited previously.
3. Press **Enter** twice, once to confirm the base solids, once to confirm an extra solid (optional).
4. The detail should be shown in the middle right image. Press **Enter** to confirm the detail.
5. The locations where the desired detail can be applied will be marked with **a green checkmark.**
6. Press **Enter** to **apply all 20** visible suggestions.
7. The section will be activated again.
8. Zoom in to the other side of the building where you didn't edit the composition plies to see the applied connection.
9. **SAVE** the file.

9 Properties

Every entity has properties. A Line entity has CAD properties such as Color, Layer and Linetype. BIM entities have these properties as well, but besides other properties are available depending on the type of entity.

1. Select one of the exterior walls and open the **Properties Panel**

2. **Mass** properties are calculated based on the geometry of the solid and are not editable.

3. **BIM** properties include spatial locations, compositions, and other BIM specific properties

4. **Quantity** properties are also calculated based on the geometry of the solid. This section also allows you to see quantities of separate composition plies (e.g. volume of concrete in a composite wall).

5. **Wall Common** is part of the IFC Common properties, governed by BuildingSmart. These are hardcoded and used by other BIM applications.
   Note: if you select a window this will show **Window Common** instead of Wall Common. You can enter values for Fire Rating or Acoustic rating here.

6. It's possible to create custom properties as well. In the **No selection Quad** under the **BIM** tab, click **Properties**. The dialog box displays for specifying and editing properties of BIM projects.

7. By default, two namespaces exist. **IFC2X3** contains the IFC common properties that we talked about earlier. **User** contains custom properties

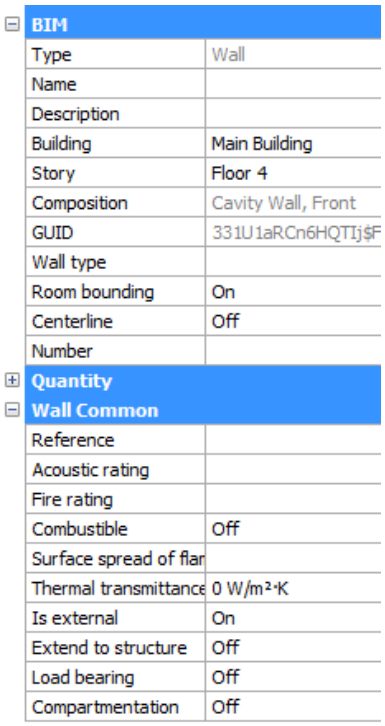
8. Add a new Property Set and give it a name, e.g. **Custom Properties**

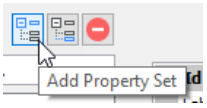
9. You can choose which types of objects this property set applies to. This way, you can make custom property sets for e.g. windows, or columns and beams, or whichever combination you want. In this case, we'll just apply it to **all** categories.

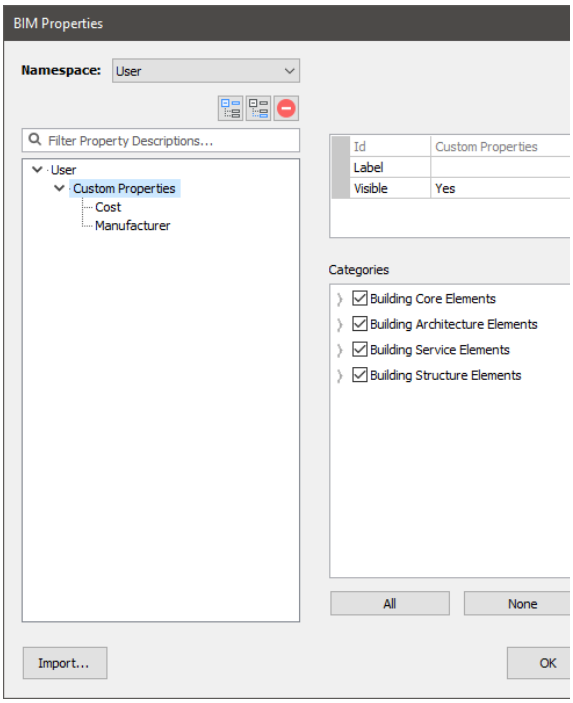
10. Add a new property to the selected Property Set and give it a name, **Cost.**

11. You can also define the type of the data:
    Boolean: an ON or OFF value.
    Integer: a whole number between -2147483648 and 2147483647.
    Real: an approximation of a real number.
    String: a sequence of characters, can be both numbers and letters.

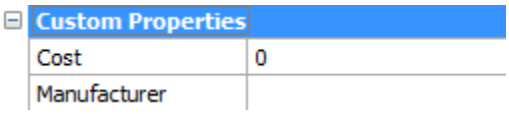
12. Change the Cost property to a **Real** type.







13. Let's add another property to this set: **Manufacturer**. The data type should be **String**.
14. If we now select any BIM entity, we should be able to see these new properties in the Properties Panel and fill in the values.



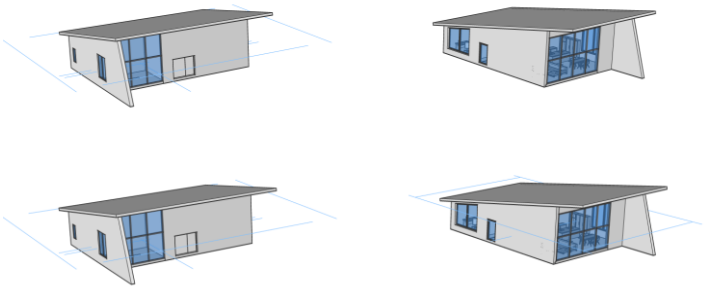
Drawing documentation basic

This module explains the basics of drawing documentation. We will use the Project Browser to set up a project and place sections and schedules, generated from our BIM model, onto sheets.

1 **Opening the file**

Open **Master.dwg** from the Exercise folder in the Drawing documentation basic folder.

2 **Adding section planes**



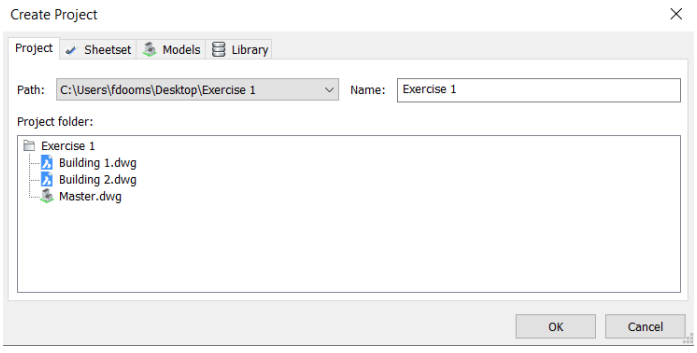
Before making a project it is better to have defined all Sectionplanes from which you would like to generate a section. You can do this by running Bimify on the model you will use for your project.

1. Let's open up the Xref of Building 2 by selecting **XOPEN**  from the Quad (select Xref: **Modify** tab.
2. We can run **BIMIFY**  (Quad: **Bim** tab) on it to generate the section planes, or manually create section planes using the **BIMSECTION**  command. Note that a section plane has a property called 'Project Section'; if this property is ON, the section plane will appear in the Project Browser and you can use it to generate drawings. Let's run **BIMIFY** on this drawing. Automatically, one floor plan and four elevations are created.
3. If we now save the file, go back to our Main model and reload the attachment in the **ATTACHMENT PANEL**  , we can see the sections appear in the drawing.

3 **Project set-up**

1. On the left-hand side of the screen, open the **PROJECT BROWSER** Panel 
2. Click **Create Project...** button in the panel.
3. **Create Project** window appears. It is divided into 4 tabs:
   a. **Project:**

      Here you see the path of the folder in which your current dwg is located. You also see all the files that are in the



specified folder, because those might be all the files that we want to keep together.

Dwg's that are noted with a building icon are models that are part of the project.

On top of the project folder structure tree, you find the path in which the folder is located and you can specify a name for the project.

b. **Sheetset:**

Here you can set the name of the .dst file that will contain all the sheets in the project.

c. **Models:**

Here you can choose which models will be included in your project. We choose Building 2 and Master to be included. For now, we don't need Building 1. We will add that one later.

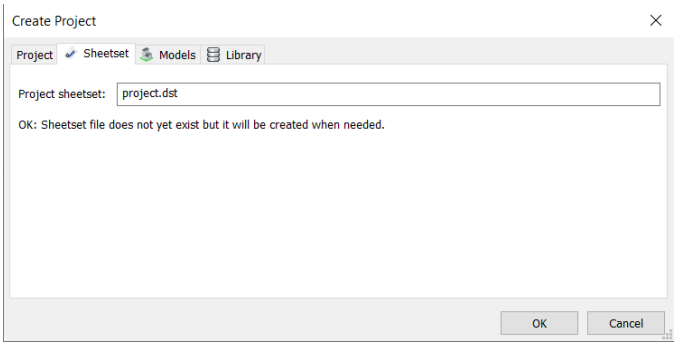
d. **Library:**

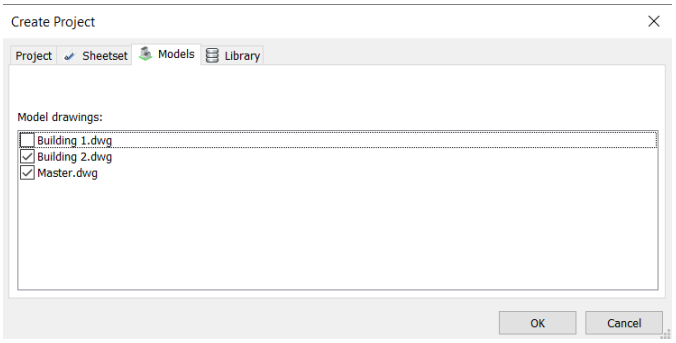
In the library tab you can find which library is used by which file. If the library is embedded in the drawing it will state 'No library'.

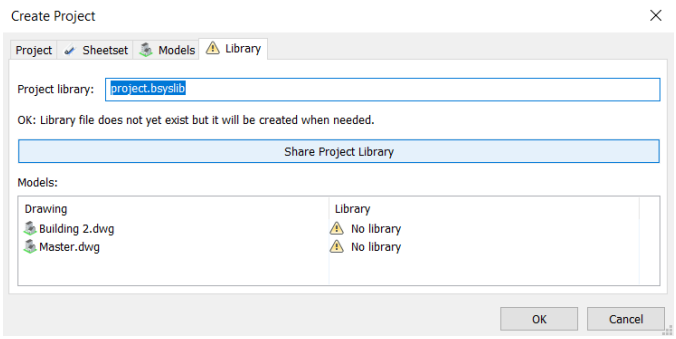
We will set a new external library to all of the models, so that they all share the same library. You do that by clicking **Share Project Library**. This will create a new file in your project folder with a .bsyslib extension. This file is a database which stores information such as materials and compositions, steel profiles, custom properties and so on. Using this external database avoids duplicating materials, and allows you to modify a material or composition over the entire project instead of just one model.

Now your three drawings share the same library. If you for example make a custom property set in one of your drawings, these properties will also show up in the other drawings and vice versa.

4. After going through the different tabs, hit **OK** to confirm the settings.







4 Sheetset set-up

1. In the second step of the creation of a project, we get the Sheetset set-up dialog. Here we can see a list of all our sections and previews of our sections onto sheets.

2. The dialog consists of 4 parts:

   a. **Info at the top:**

   You see the path of the sheetset that you specified in the previous step. You see the sheetset template that is being used. You can specify your own here if you wish. You see the layout that is selected, is available in the sheetset template.

   b. **Sections:**

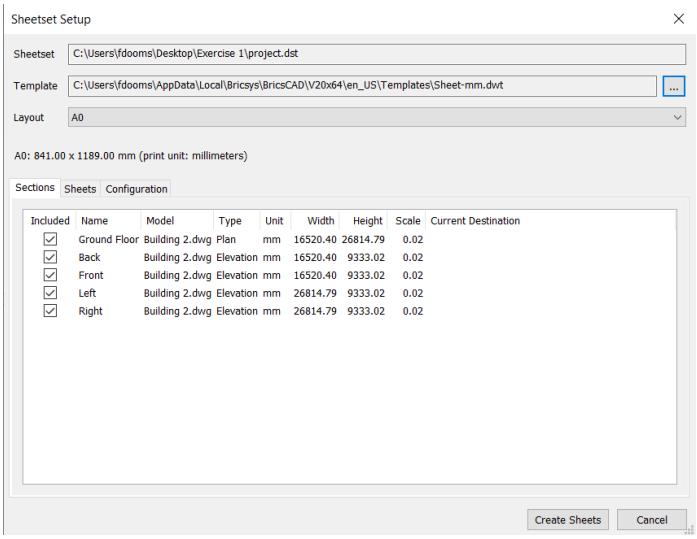
   You see all the sections available in the models of your project. You can select or deselect them to be placed onto sheets. If a section is already placed on a sheet then this is stated in the 'Current Destination' column. These sections will not be placed onto any new sheets, so that the current destination will never be overwritten. You can also change the scale of the drawing. To begin, the sheetset set-up takes the scale specified in the Properties of your section planes. By double-clicking the scale however, you can still change it afterwards.

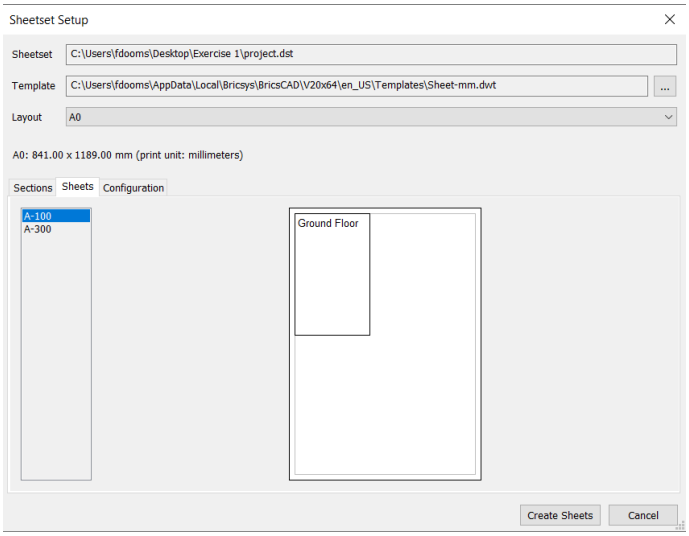
   In this project we will accept the default: include all the sections with their predefined scale.

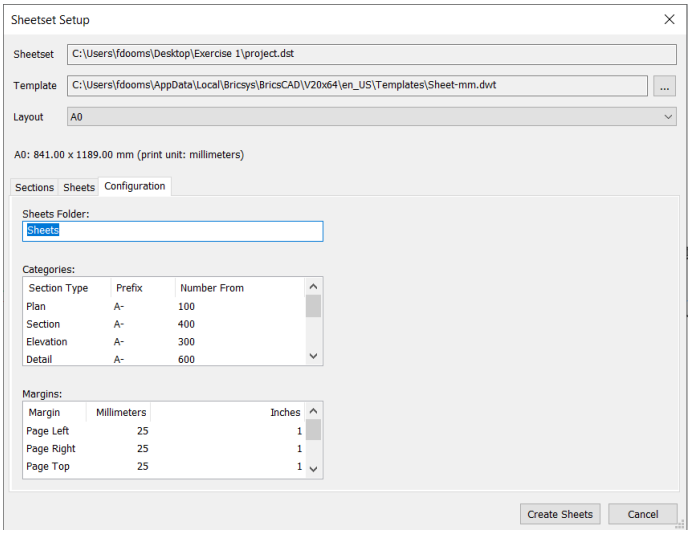
   c. **Sheets:**
   Here you see a preview of your sections' outline onto your sheets. We are creating 2 sheets now: one with the floor plan, called A-100, and one with the elevations, called A-300.

   d. **Configuration:**
   Here you can specify some naming options, as well as make sure that different types of sections are placed onto separate sheets or onto the same sheet. You can also specify margins. We will not touch the default settings however.

3. Click on **Create Sheets** to finish the project and sheetset set-up.

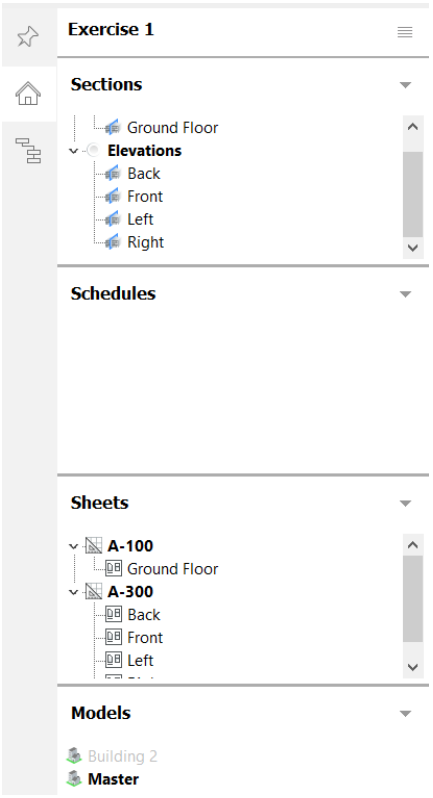






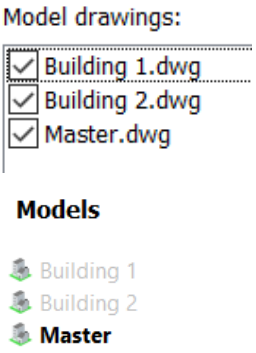
5 Explore the project

4. You now can see that the project is created and it has 4 tabs:
   a. The first is the *sections* tab with a list of all sections in the project. If you right-click one you can select one, with 'Select Section Entity', or go to its view, with 'Display Section Result', if there is already a sheet with this view on.
   b. In *schedules,* you will be able to find all schedules that were generated. Schedules list quantities of your model, specified in the order that you want. We don't have any schedules for now, but we will make them further on in this training.
   c. In *sheets,* you find all the sheets in the sheetset. You can enable BricsCAD to update them in a background process: the ones without icon are already updated, the ones with the loading sign are in progress and the ones with an orange dot next to them are queued and will be done after the previous one is finished. To enable background updating, click the hamburger menu in the top right corner of the panel and check the setting **Enable Background Update**. You can still manually update sections by right-clicking the section result you want to update and selecting 'Update'. You can also display the section results by right-clicking on them and selecting 'Display View'.
   d. In *models,* you can find the models in the project and you can navigate to them by double-clicking them.
5. Normally, the Project Browser should now be populated with a set of 5 sections, 2 sheets and 2 models: the master file as well as the one Xref we included.

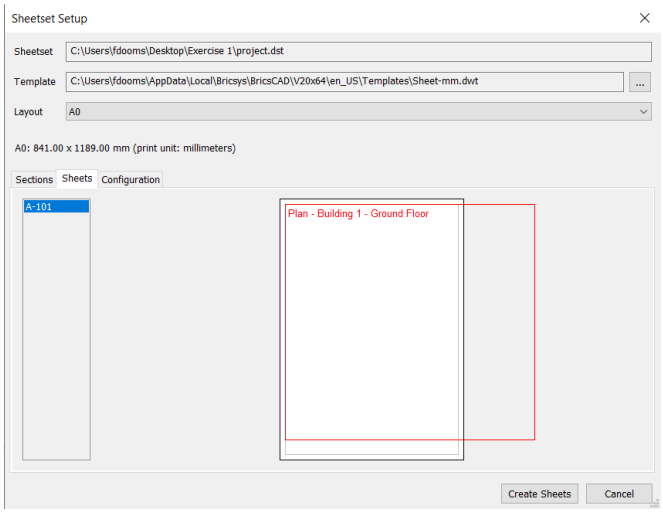


6 Edit the project

1. We now want to include Building 1.dwg as a model after all.
2. To do this we can go to the hamburger menu in the top right corner of the panel and click on **Project set-up**.
3. Then we get the same dialog as upon creation.
4. Go to the *models* tab, check the checkbox of Building 1.dwg and hit **OK**.
5. We now see that in the Models tab of the PROJECT BROWSER 'Building 1' is listed as one of the models. You also see that in the Sections tab the sections from Building 1 are listed as well now.

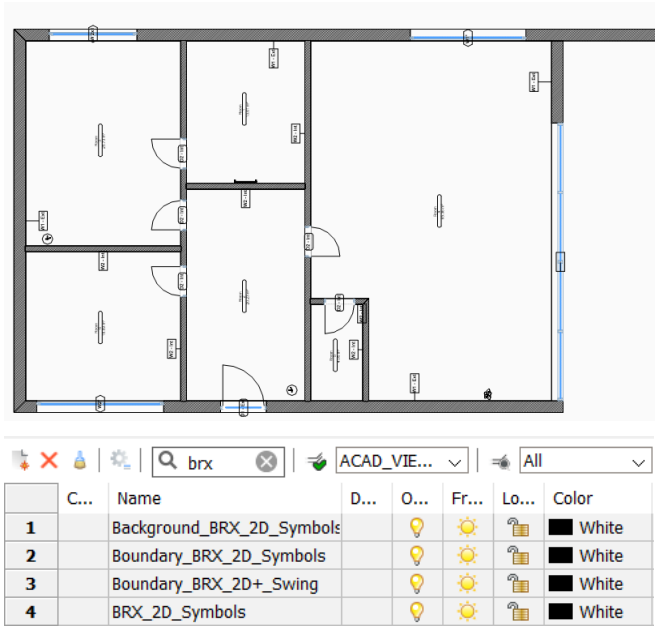


7 Add new sections to new sheets



1. If we go to **Sheetset Setup** (under the hamburger menu ☰) we can now include the new sections on new sheets.
2. We get the same dialog as during the creation of the project.
3. Now you see that in the Sections tab we have sections that already have a current destination filled in.
4. In the Sheets tab, we get three sheets: one for the plan, one for the elevations and one for the vertical sections. The sections that already had a destination file are not placed onto these sheets again.
5. Let's try and change the default scale to **0.05** for the section 'Plan – Building 1 – Ground Floor' in the Sections tab.
6. If we now go back to the Sheets tab, we see that if the viewport is too big for the paper size, it will turn red.
7. We can go back to Sections to change the scale back to **0.02**, so that the sections fit the sheet again.
8. Hit **Create Sheets** to create the sheets.
9. We see that the sheets are added to the tab Sheets and they are again automatically updated in the background.

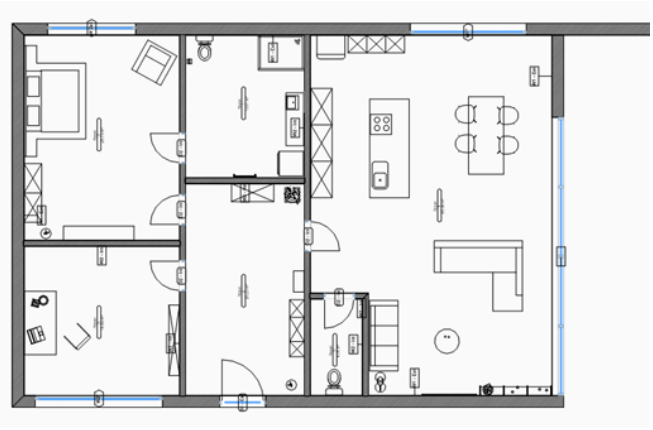
8 Check generated drawings



1. To see the resulting drawing of section Ground Floor, right-click **Ground Floor**, and select **Display Section Result** in the flyout menu.
2. The floor plan is placed on a sheet and we see the cut through representation of the walls, as well as some automatically placed tags. However, We don't see the furniture.
3. To fix that, filter on **BRX_2D** in the **LAYERS PANEL** ⧉. Make sure all layers with this in their name are turned on.
4. If the BRX_2D layers are turned on we see our furniture. This happens because our real section was replaced by a 2D symbolic representation. The component we cut through had a 2D representation on the BRX_2D layer and this makes that our actual section will be overwritten. If you want a 2D representation together

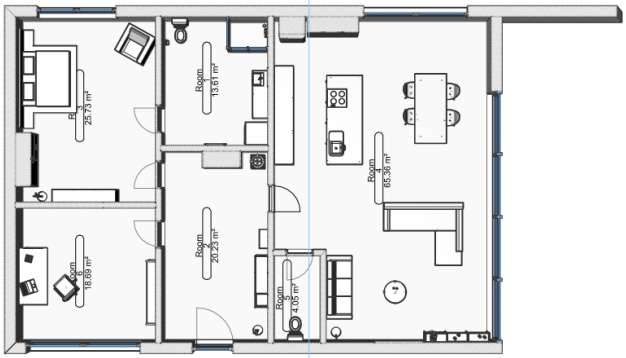
with the actual section, you need to use the **BRX_2D+** layer. This is, for example, handy for doors, where you want to display a door swing together with the cut-through representation of the door.

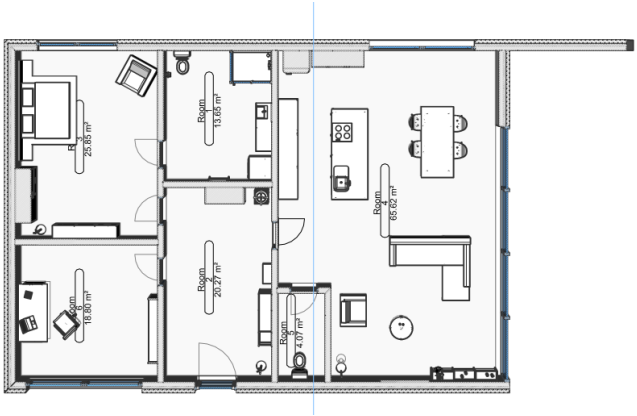
5. We will discuss in more detail the created layers in the Drawing Documentation Advanced module.

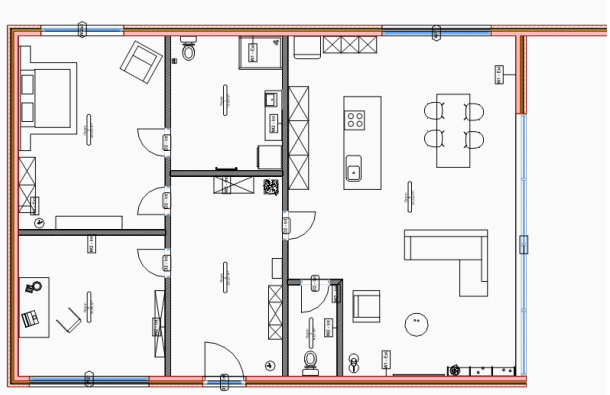


9 Changing the 3D model

1. Let's make some changes to the BIM model and update the floor plan. Open up the Xref of Building 2 by selecting XOPEN from the Quad (select Xref: **Modify** tab).
2. Clip the section plane of **Ground Floor** by double-clicking the section plane or selecting CLIPDISPLAY in the Quad (Select section plane: **Model** tab).
3. Select an interior door and Quad select BIM Flip (Select door: **Model** tab). The door swing is flipped.
4. Delete the couch in the living room.
5. Open the COMPONENTS PANEL .
6. Browse to the **Furnishing Elements**.
7. Drag a chair into the living room.
8. Give the outer walls the composition **Cavity Wall, Brick** by first selecting the walls and then drag and drop this composition from the COMPOSITIONS PANEL onto the selected elements.
9. Save drawing Building 2.dwg.
10. Switch to the **Ground Floor** plan.
11. Update the floor plan either using PROJECT BROWSER or select the BIM Viewport and Quad select UPDATE SECTION (Quad: **Model** tab).
12. The floor plan view will update to display the changes.

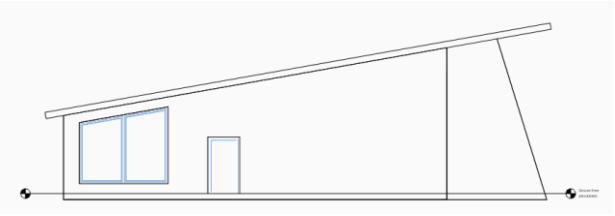


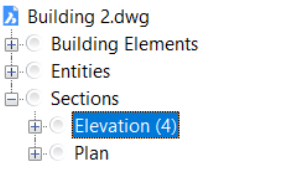




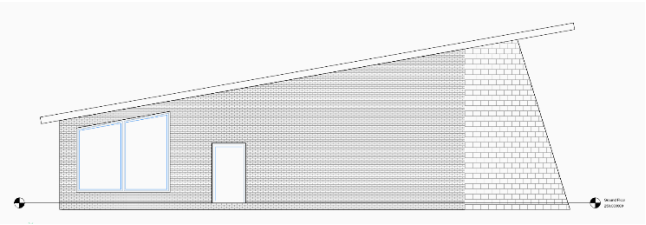
10 Elevation hatches

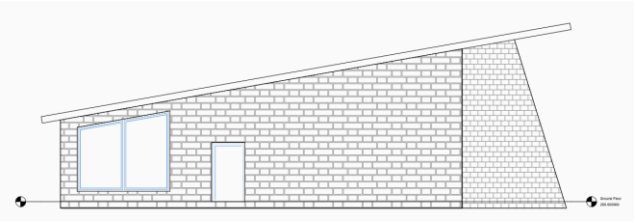
1. Open the elevation **Left** by double-clicking on the name **Left** in the Sheet list.
2. We see that now there is no elevation hatch applied. In V20, we can change that.
3. To do that, go to Building 2.dwg, by clicking on **OPEN MODEL** in the Quad (Quad: **Model** tab) while the viewport is selected.
4. Go to the **STRUCTURE BROWSER** and select all the elevations.
5. Go to the **PROPERTIES PANEL** and set the property **Generate elevation fill** on.
6. Save the drawing.
7. Go to the elevation **Left** and **UPDATE SECTION** (Quad: **Model** tab).
8. The section now has an elevation hatch attached to it.
9. If we want to change the elevation hatch, we can do so in the outermost ply of the composition that makes up the wall we are looking at.
10. So go to **Building 2.dwg**. Open the **COMPOSITIONS PANEL**. Open the composition **Cavity Wall, Brick** by double-clicking it.
11. Open **Facing Bricks, Hand-formed** by double-clicking on its name.
12. Go to the **Appearance** tab and change the Elevation hatch by double-clicking on the hatch pattern under the section **Elevation** and choosing a hatch.
13. Click **OK** twice.
14. **UPDATE SECTION** (Quad: **Model** tab) **Left**.
15. The hatch pattern has changed.





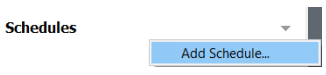
BIM	
Name	
Description	
Section type	Elevation
Callout position	Mid
Scale	0.02
Layer state	*Varies*
Apply layer state	Off
Project section	On
Generate tags	On
Generate elevation fill	On



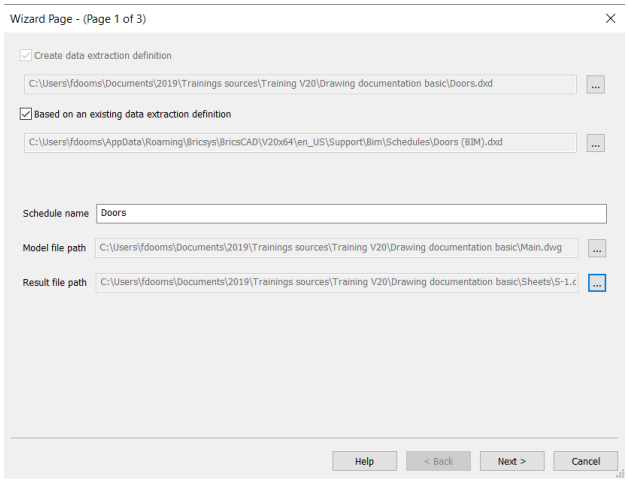


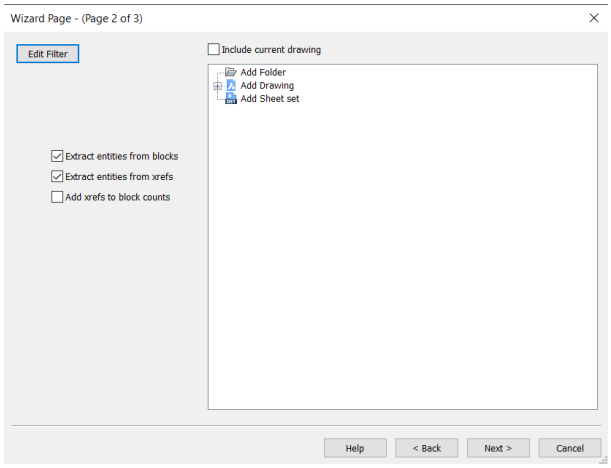
11 Shedules

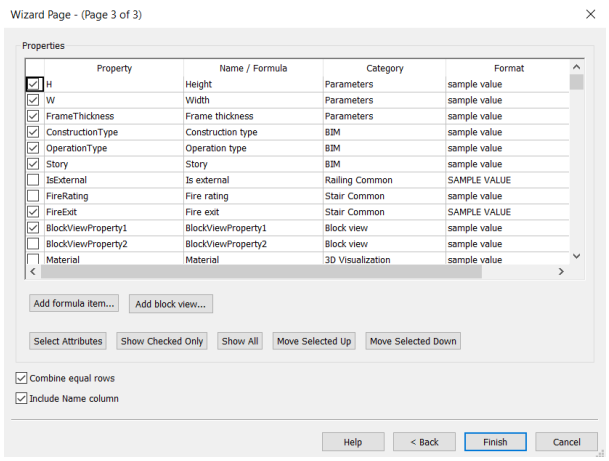
1. We now want to create a schedule of the doors in Building 2.
2. Go to the **PROJECT BROWSER** and right-click the header **Schedules**.

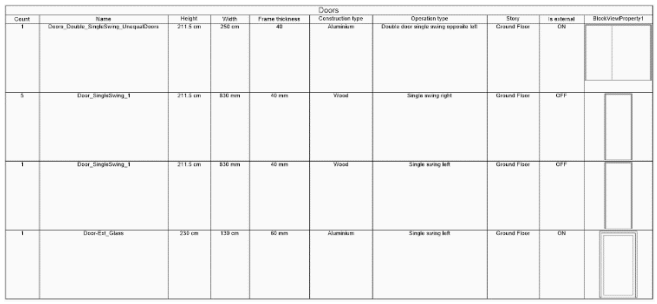


3. Click **Add Schedule…**
4. You end up in a wizard where you can choose a file with a customized pre-set of what data you want to include in your schedule. This file is called a dxd-file or data extraction definition in full. You can set it by checking on the box **Based on an existing data extraction definition**.
5. Click the three dots and choose the dxd file **Doors (BIM)**.
6. You can name your schedule how you like and specify a sheet on which it needs to be saved. For example, save the schedule named Doors on S-1.dwg.
7. Click **Next**.
8. On this page, you can choose whether or not you want to extract entities from blocks and xrefs. We **don't** want to extract entities from blocks so turn this **off**.
9. Click **Next**.
10. On this page, you can still choose to exclude or include some more properties, but we would like to keep it as it is specified by the dxd. Except for the **BlockViewProperty2, Fire rating** and **Fire exit**, which we turn **off**. BlockViewProperty1 is kept turned on. This will show an image of the block in our schedule.
11. Click **Finish**.
12. Right-click on the name **Doors** and hit **Update**.
13. Then right-click again and hit **Display Schedule**.
14. We now see which kind of schedule is created: you can find the name of each component, the amount of times it is in the model, the height and width, some properties and an elevation, which is convenient to know about which block we are talking.









Collaboration

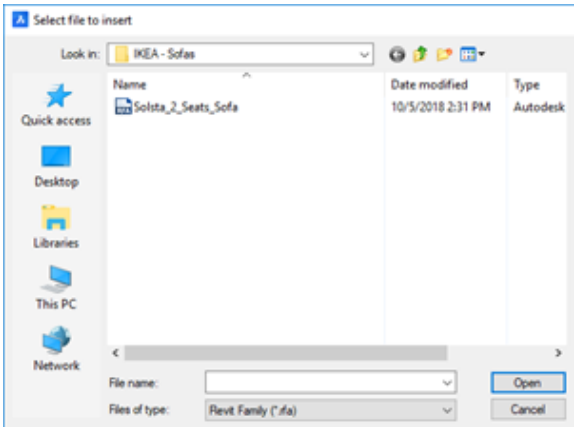
This module explains how to collaborate during the design of a project. You will learn how to import and export IFC files, as well as import Revit files. There is also a demo that goes along with this module, to show you the 24/7 panel and the BCF panel in BricsCAD.

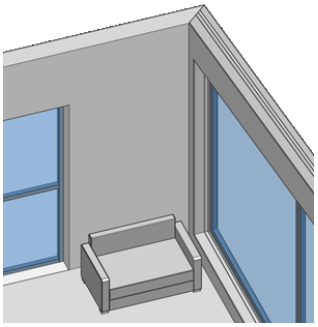
1 Importing Revit families

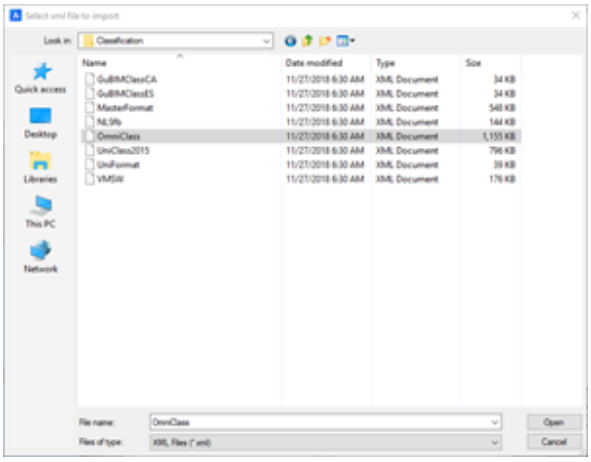
1. Open **Final model.dwg**.
2. Select the roof.
3. Quad **HIDE ENTITIES** . The roof is hidden.
4. Quad select: **BIMINSERT** .
5. In the dialog box, select .rfa from the **Files of Type** list.
6. Browse to the **IKEA, IKEA-Sofas** (this folder was provided at the beginning of the session).
7. Double- click on it or Press **Open.**
8. Select **Solsta_2_SEATS-Sofa**, and Press **Open**.
9. Insert the Sofa component somewhere inside the model.
10. Select the Sofa, open the **PROPERTIES** from the Quad or **Toolbar.**
11. Press the **IMPORT** button in the BIM Properties dialog box.
12. Choose the **OmniClass** file from the Support folder.

C:\Users\<User>*AppData\Roaming\Bricsys\BricsCAD V19x64\en_US\Sup Support\Bim\Classification*

13. Press **Open** and **OK.**
14. OmniClass properties should be added to the properties panel.
15. Click the arrow icon on the right-hand side (**OmniClass classification code** section) and choose **23-21-23-13-15 Residential Sofas** to assign the classification code.







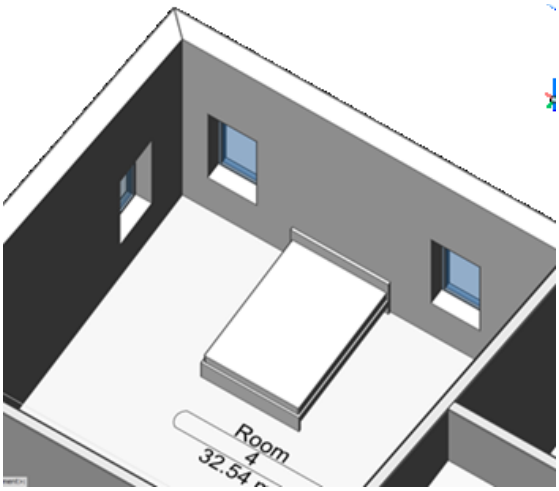
23-21 23 13 15 Residential Sofas
23-21 23 13 17 Residential Stools
23-21 23 13 19 Residential Benches
23-21 23 13 21 Residential Chaises Lounges
23-21 23 13 23 Residential Sofa Beds
23-21 23 13 25 Residential Chair Beds
23-21 23 15 Residential Tables
23-21 23 15 11 Residential Dining Room Tables
23-21 23 15 13 Residential Sideboards

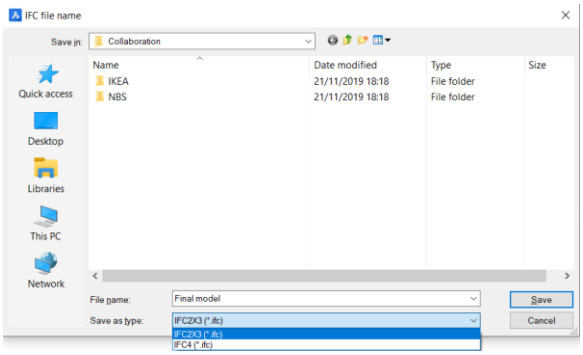
2 Import/Export IFC file

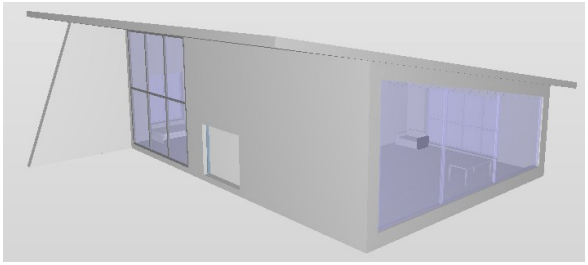
1. Click **File** in the Menu Bar and select **Import**. The import file dialog box displays.
2. Select the **.ifc** file format from the **Files of Type** list.
3. Browse to the **NBS** folder (this folder was provided at the beginning of the session).
4. Double- click on it or Press **Open.**
5. Select **Double_Bed**, and Press **Open.**
6. Double Bed component is inserted to the origin.
7. Use **MOVE** command or **MANIPULATOR** to place the NBS component inside one of the rooms.
8. When the **Double Bed** is selected, change its building and story information in the properties panel.
9. Change the building information from **IFC Building-1** to **Building 1**, story information to **Ground Floor.**
10. Quad Show Entities.
11. Type **IFCEXPORT** in the command line and press **Enter** to select the entire model.
12. The **IFC file name** dialog box displays. Select IFC 2x3. Note that in V20 you can also select IFC4 as an option.
13. Click **Save** to export the model as an IFC model.

The exported BIM model is saved as an IFC file and it is ready to use in any IFC certified applications.

The image on the right shows the final model in Solibri.







Increasing LOD

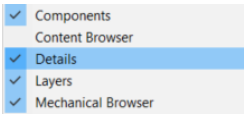
This module explains how to further increase the level of detail in your model.

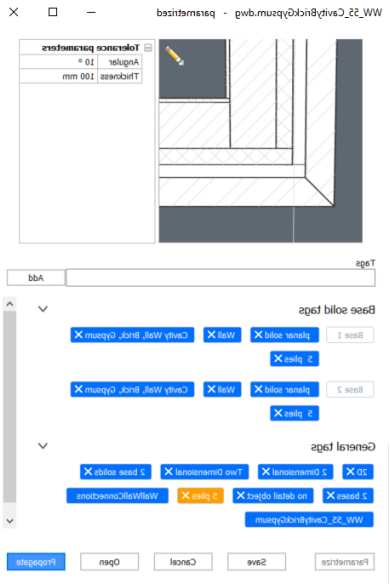
1 Details Panel

On Windows, paste the details from the Details folder in the following path: *C:\ProgramData\Bricsys\Support\Bim\Details.*

For Mac open the Finder, go to the Go tab and click on 'Go to folder…' and type in *var/Bricsys/Details*. Paste the content of the Details folder there. The Details folder can be found in the folder 'Increasing LOD'.

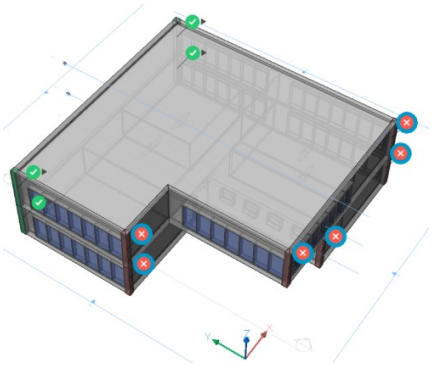
The **Details Panel** is a new panel where you can store construction details, like planar details (e.g wall-wall connections, wall-roof connections, etc), structural steel details and MEP details.
This way you can use a certain detail not only inside one drawing but also in other drawings outside a certain project.



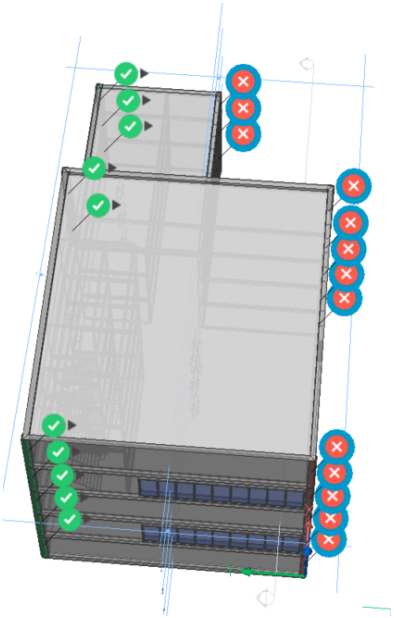


1. Open **'SecondBuilding LOD.dwg'**
2. Turn **ON** of the **Floor Plan section (Floor 1)** by using **CLIPDISPLAY** or by double-clicking.
3. Zoom in to the **Wall, Front - Wall, Back-** connection
4. Open the **Details Panel** on the right-hand side of your screen. If the panel is not shown, right-click a blank menu area and select **Details.**
5. It should appear with an icon in the Tool Panel. If it appears as a standalone, drag it over Tool Panel and position cursor until the large rectangle turns blue and release.
6. Like most of the dockable panels in BricsCAD, it is equipped with a search tool so you can quickly find the specific detail you are searching for. In the Details Panel, this search function works with tags: **solid tags, general tags, and customized tags**.
   Use the search button to find all wall connection using the **Wall-tag**. Click on the **+ sign** once.
7. Choose the detail **'WW_55_CavityBrickGypsum.dwg'** and open it by double-clicking.

2 Propagate saved Details

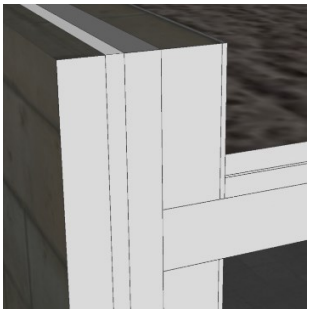


1. Click **Propagate** in the detail dialog.
2. The locations where the desired detail can be applied will be marked with **a green checkmark**
3. Only apply the suggestions on the connections of the blind facade (like the image).
4. Press **Enter** to apply all 4 suggestions.
5. The floor section will be activated again.
6. Zoom in to the **Wall, Front - Wall, Back-** connection again to see the difference.
7. Close the section plane.
8. Open **'Main Building LOD_Start.dwg'**
9. Drag and drop the detail **'WW_55_CavityBrickGypsum.dwg'** into the drawing to propagate.
10. The locations where the desired detail can be applied will be marked with **a green checkmark**
11. Only apply the suggestions on the connections of the blind facade (like the image).
12. Press **Enter** to apply all 10 suggestions.
13. Turn **ON** of any **Floor Plan section** by using CLIPDISPLAY or by double-clicking.
14. Check the new construction detail.
15. Close the section plane.

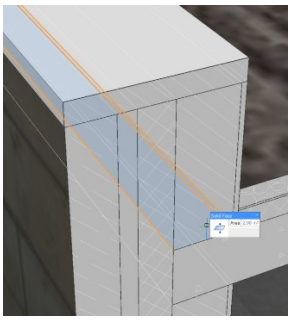


3 Create an advanced Detail

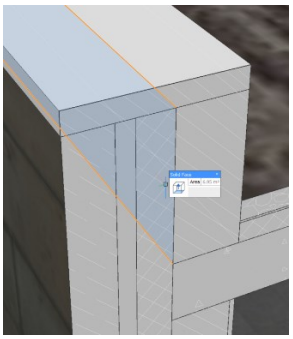
1. Open **'SecondBuilding LOD.dwg'**
2. Open the **vertical section plane**.
3. Zoom in to the connection of the roof slab and exterior wall.
4. Since you will be editing the plies of the compositions, **Selection of faces should be ON** in the ribbon or SELECTIONMODES should be **value 2**.
5. Hover cursor near the concrete surface of the roof slab, and press Tab until the Ply Face (green) of the concrete is highlighted.
6. Quad select PUSH/PULL and move it to the insulation layer of the wall (like the image on the right).



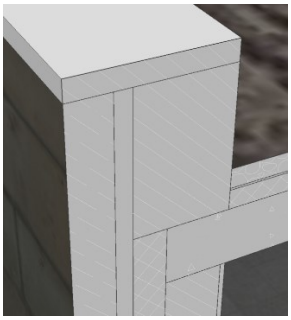
7. Let's add a wall cap on the rooftop edge. Hover cursor on the top face of the exterior wall, press **Tab** until the Solid Face (orange) is highlighted.



8. Quad select **SOLID EXTRUDE**  , drag the face up to create a new solid.
9. Type in **50mm** for the height and press **Enter**. Now a new wall cap solid is created in the construction detail.
10. Hover of the horizontal face (orange on the image) and **SOLID EXTRUDE**  to delete the part until the wall cap.

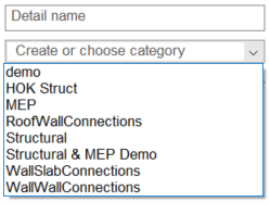


11. Highlight the same horizontal face and **SOLID EXTRUDE**  to create a new solid for insulation.
12. To finish, highlight the side face of the new insulation solid and **PUSH/PULL**  to the next ply of the wall (see last image on the right).
13. **Selection of faces can be turned OFF** in the ribbon or **SELECTIONMODES** should be **value 0**.
14. Open the **BIM Compositions Panel**  and search for **'Concrete'** (Show only compositions in project should be off).
15. Add following compositions to the 2 newly created solids by dragging and dropping the compositions:
    - Wall cap: **'Concrete, Plain'**
    - Insulation block: **'Supporting Wall, Cellular Concrete'**

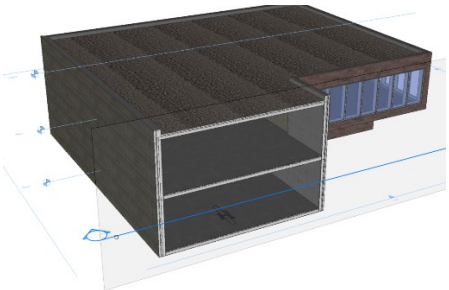


4 Save Details in the Details Panel

1. Type in **BIMCREATEDETAIL** in the command line.
2. A dialog will pop up to specify info about the detail. Type in de detail name, for example, **Rooftop detail**
3. Assign the detail to an existing category in the dropdown menu. Or create a new category by typing the new category name, for example, **BIM Training**

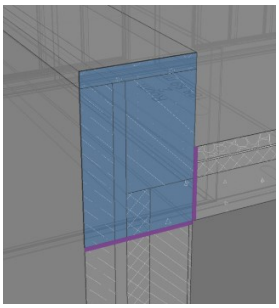


4. **Select the base solids of the detail**: these are the original solids used to create this construction detail. Here in this example, you should select the roof slab and the exterior wall.
5. **Select the detail entities**: these are the new solids created when editing the detail. In this

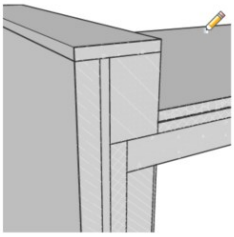


detail, we have the wall cap and the insulation block that you should select.

6. **Select section**: the vertical section plane that is currently open on the construction detail (see image on the right).



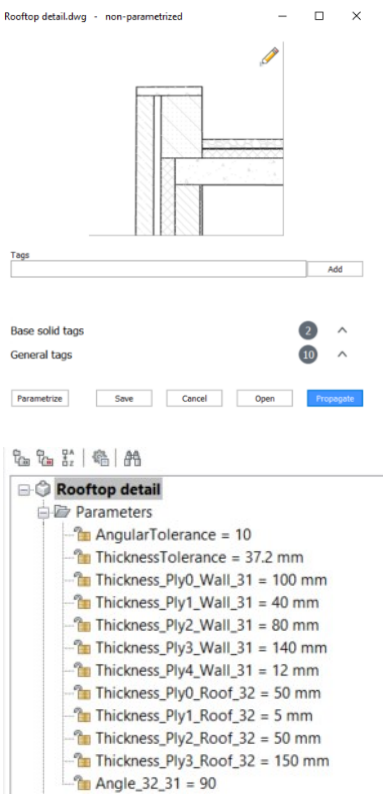
7. When all the information of the detail is added, click **Create**.
8. You are prompted to confirm and accept the detail: Press **Enter** once to accept the detail.
9. A new **'Save detail'** dialog box will pop up. Here the detail name and category are displayed again, you can change it if you need to.
10. It is possible to change the thumbnail of the detail by clicking the pencil icon on the top right corner.



11. Change the view of the detail you want and press **Enter**.
12. **Base solid tags (2)** and **General tags (7)** are automatically created. You can delete them if you want to, but you can also create your own tags for this detail.
13. Let's create an own tag by typing **'Wall cap'** and click **'add'**. The new tag is added to the **General tags (8)** and is displayed in orange.
14. Click **SAVE** to finish.

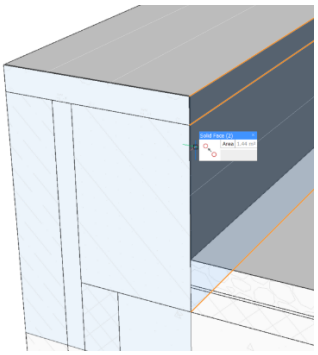
5 Parametrize details

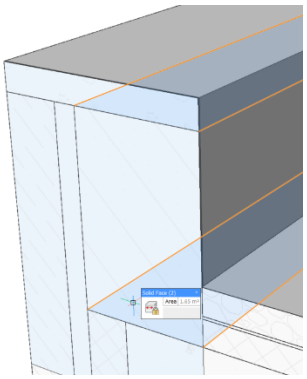
1. Open the **Details Panel** on the right-hand side of your screen and search for tag **'Wall cap'**.
2. Click on the detail you have just created. On the top of the dialog box, you can see that the detail is non-parametrized. That means that the detail doesn't have any parameters and the thicknesses and angles of the plies are fixed.
3. Let's change that by adding parameters to this detail. Click on **'Parametrize'**.
4. The parameters are automatically added to the detail and the detail will be opened in a new .dwg- drawing **'Rooftop detail'**.



5. Open the **Mechanical Browser** to check the parameters and constraints added to this detail.
6. You can check the change in ply thicknesses by selecting a parameter, for example, **'Thickness_Ply3_Roof_32'** and right-click choose **'Animate'**.

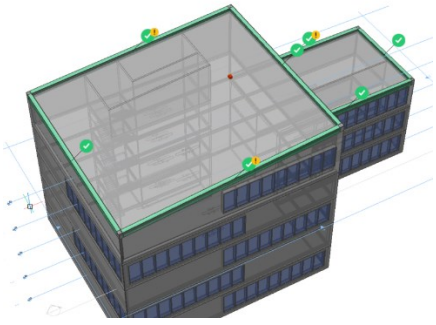
6 Editing Parametrize details





1. **Animate 'Angle_32_31'**.
2. Let's add some constraints to the detail to create the ideal Angle-parameter for your construction detail.
3. **Selection of faces should be ON** in the ribbon or **SELECTIONMODES** should be **value 2**. Boundary Detection should be OFF.
4. Select the faces to the wall cap and the insulation solid (like the image of the right) and Quad select **COINCIDENT CONSTRAINT** . This means that the face of the wall cap and the face of the insulation will be the same.
5. **ADD DISTANCE CONSTRAINT** on the top and bottom surface of the wall cap, distance should be **50mm** (Press **Tab** until you highlight the right surface). The distance of these two faces will always be 50mm when the angle of the details will be changed.
6. **ADD DISTANCE CONSTRAINT** on the top and bottom surface of the insulations solid, distance should be **355mm** (Press Tab until you highlight the right surface). The distance of these two faces will always be 355mm when the angle of the details will be changed.
7. **Animate 'Angle_32_31'** again to check the result.
8. **Selection of faces can be turned OFF** in the ribbon or **SELECTIONMODES** should be **value 0**.
9. Select **'ThicknessTolerance'** and change the parameter to **100mm**.
10. **SAVE** the drawing and close.

7 Propagate Parametrized details



1. Open drawing **'Main Building LOD.dwg'**.
2. Choose the parametrized **'Rooftop detail'** in the Details panel.
3. Drag and drop the detail into the drawing.
4. The locations where the desired detail can be applied will be marked with **a green checkmark**
5. **Enter** to apply all 7 suggestions.
6. Zoom in to the rooftop edge to see the change.
7. Close the section plane.
8. **SAVE** the file.

Structural modeling

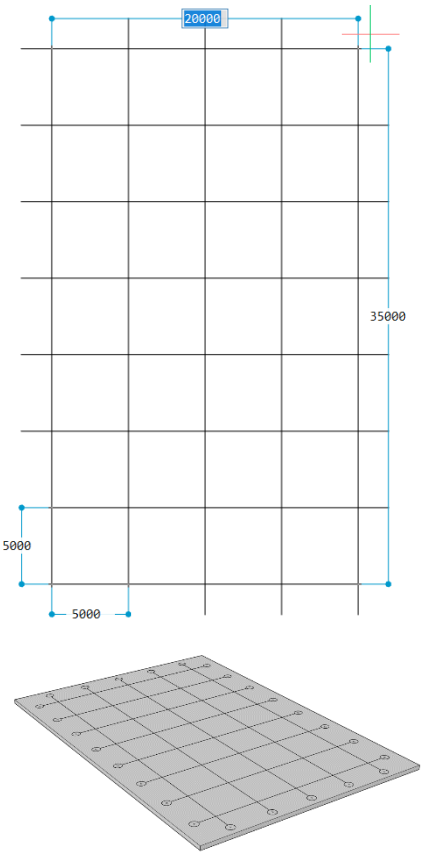
How to model a steel structure and how to detail it using propagate and the details panel.

1 **Open a new mm drawing and save it**

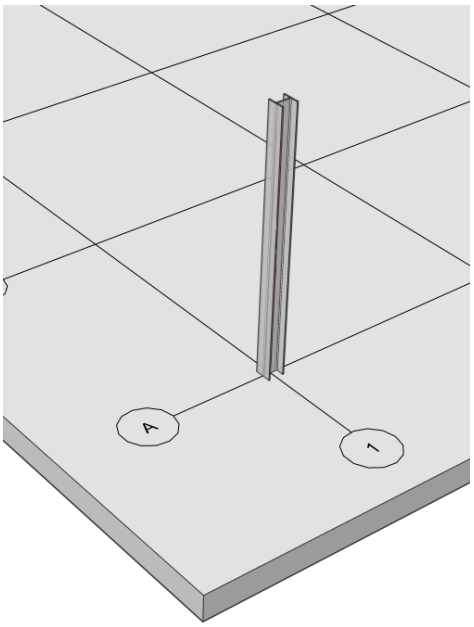
2 **Creating a base grid**

We'll start by creating a grid, and drawing a base slab underneath it

1. In the Quad under the **Model** tab, click **BIMGRID**  . Choose a start point by left-clicking
2. Type in values for the grid sizes, using **Tab** to switch between dimensions until you get the values as shown in the image on the right (i.e. grid cells of **5000 x 5000** and a total grid size of **35000 x 20000**)
3. Start the **BOX**  command, and start drawing somewhere outside of the grid
4. Choose the opposite corner so that the grid is entirely on top of the slab (see image)
5. Type in **500** to give the slab a thickness, and press **Enter**

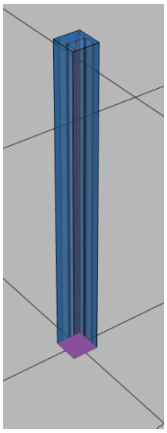


3 Creating a column



1. Open the **PROFILES PANEL** on the right of your screen.
2. Choose Domain: *Structural Steel.*
3. Choose Standard: *EURO.*
4. Click the I-shape icon, and search for **HEA**.
5. Drag the **EURO HEA 300** profile into the modeling area.
6. Start drawing the linear solid at the intersection point of two of the grid axes. Draw vertically upwards (make sure ORTHO or POLAR is enabled). Make sure the orientation is as indicated in the image on the right (i.e. flanges parallel with the Y-axis). If the orientation is not as shown in the image, you can enter **Q** and press **Enter** while still drawing to give the profile a Quarter Turn.
7. Enter a height of **5000** and press **Enter**.

4 Understanding Propagate

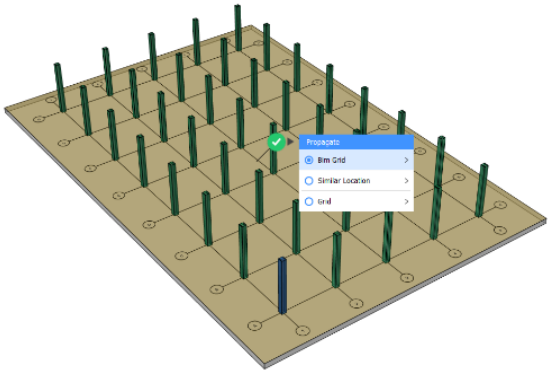


Propagate is a very versatile tool that can be used in many different situations. It is used to automatically copy objects or details to similar locations.

The key concept: there are 2 selection sets:

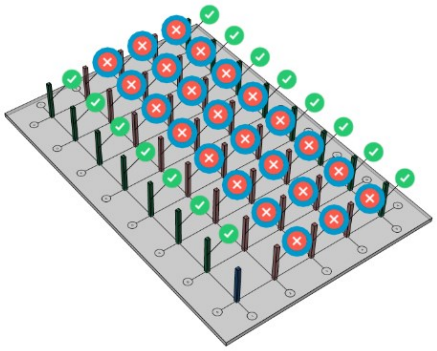
- Base solids: solids that define the relation of that detail. Specify as many base solids as relevant!
- Detail solids: solids that need to be copied around.

We already saw some use cases of Propagate in the basic training. In this section, we'll use propagate to copy the column to every grid intersection.



1. Highlight the floor slab, and in the Quad under the **Model** tab, click **PROPAGATE** .
2. Select the column **solid** as your detail, and press **Enter**.
3. You will be automatically zoomed into the 3D detail. We don't want the detail to be copied as a Block, but as a **Copy**, so press **C** and then press **Enter.**
4. Propagate automatically detected that a grid was attached to the slab. It will make the first suggestion (see image).

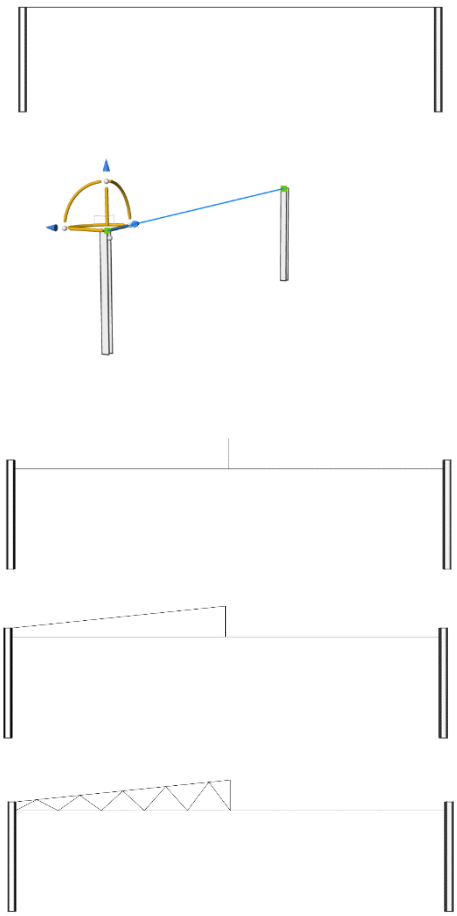
5. Hover over the green checkmark and click *Bim Grid* in the little dialog window.
6. Then, click *Explode,* and the entire grid will be exploded in a set of suggestions. We can now manually toggle off individual suggestions. Create a pattern as shown in the image. Make a selection set over the checkmarks you don't need and toggle them all off at once by clicking one of the checkboxes you just selected.
7. Press **Enter** twice to accept.



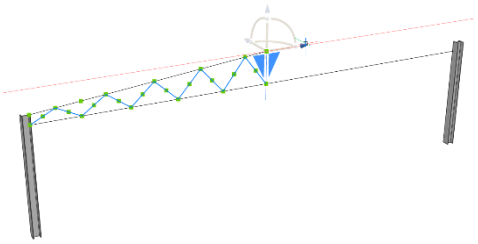
5 Creating the truss

1. To work more easily, turn **off** the display of sides and ends of linear solids in the ribbon (can also be changed by typing in DISPLAYSIDESANDENDS**).**
2. Isolate the two columns of the first row.
3. Draw a line (select LINE from the **Annotate > Draw** tab) between the midpoints of the insides of the top of the beams.

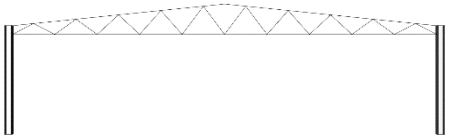
   NOTE: Make sure **Midpoint** is active in **ESNAP**.
4. Move down the line **400** mm by long left-clicking it and thus activating the MANIPULATOR. Choose the vertical bar, move it downwards and type in **400**.
5. Press **Esc** to exit the Manipulator.
6. Draw another line, this time from the midpoint of the previous polyline upwards for **1400** mm.
7. Draw another line, this time from the endpoint of the previous polyline to the midpoint of the inside of the left beam.
8. Divide the bottom horizontal line into 20 segments and the upper one into 10, by using the DIVIDE command (Quad: **Draw** tab) and entering **20** for the bottom line and **10** for the upper one.
9. Draw lines again. This time creating a truss pattern as specified on the image to the right.
10. Delete the points that were created by going to the STRUCTURE BROWSER and selecting them and hitting the **Delete** button.



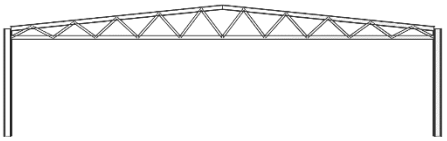
11. Select the truss pattern and upper line and bring up the **MANIPULATOR** (Quad: **Modify** tab). Drag the Manipulator to the right spot by using the little white grips. Stand on the little blue **Flip along X-axis** icon and flip the truss.



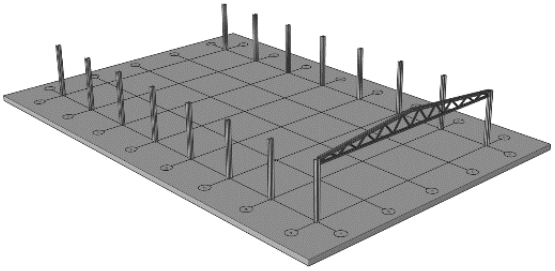
12. Enter **C** for Copy and enter the distance **0**.
13. Press **Enter** to accept and **Esc** to go out of the command.



14. Delete the midlines.
15. Search the **EURO IPE 240** beam by typing in **IPE** in the search box.
16. Drag it to the bottom line. The line changes into the profile. Click **Enter** to accept if it is rotated correctly.

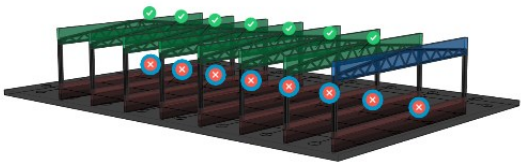


17. Select the top lines.
18. Search the **EURO IPE 200** beam.
19. Drag it to the top lines. The lines change into the profile. Click **Enter** to accept if it is rotated correctly.
20. Select the truss lines.
21. Search the **EURO IPN 100** beam by typing in **IPN** in the search box.
22. Drag it to the truss lines. The lines change into the profile. Click **Enter** to accept if it is rotated correctly.

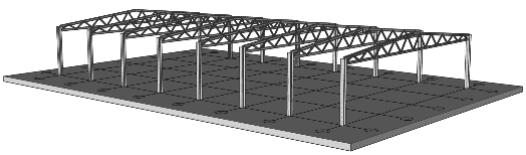


23. The truss is created.
24. The top beams were probably classified as members. **BIM CLASSIFY** them **AS BEAMS**.
25. Delete the line entities via the Structure Browser.
26. Show all entities.

6 Propagating the truss

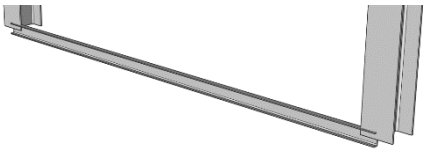


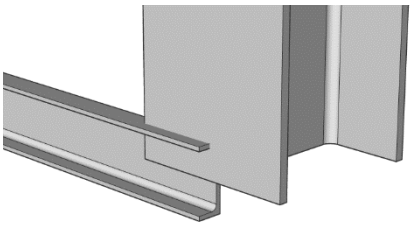
1. Launch **PROPAGATE**.
2. Select the two front columns as base solids.
3. Select the truss as detail solids.
4. Press **C** to copy as solids. Press **Enter**.
5. Toggle off the bottom suggestions.
6. Press **Enter** twice to accept.

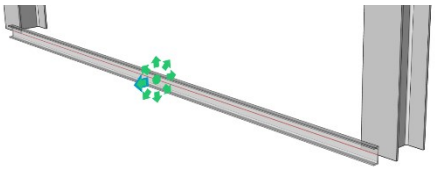


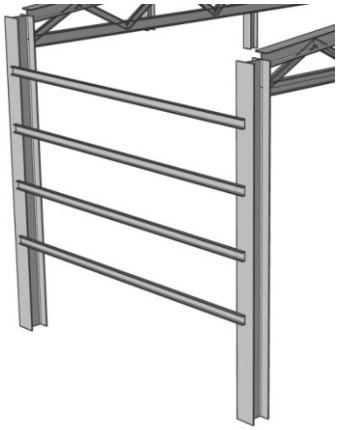
7 Adding sidebars

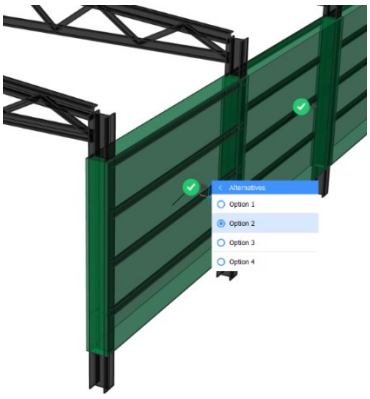
1. Hide the slab and the grid.
2. Search for **EURO UPN 120** in the PROFILES PANEL by typing in **UPN** in the search field.
3. Drag and drop the profile in empty space.
4. Make the profile from the outer bottom midpoint of the first column to the outer bottom midpoint of the second column (in the Y direction). Quarter turn by pressing **Q** during the command, to get the profile turned like in the picture to the right.
5. Highlight the U-shaped profile, and in the Quad under the **Model** tab, click ADD ECCENTRICITY.
6. A widget appears. Click the *Outer* arrow to make sure the beam moves outwards with respect to its axis. Press **Enter**.
7. Long-click the U-shaped profile to get the MANIPULATOR and press the vertical bar to move the beam upwards by **1500** mm.
8. Press the up bar of the Manipulator again. Press **R** for Repeat. Enter the height of **900** mm. Move the cursor upwards until you have 4 bars. **Click** in the space above the 4 bars. Press **Esc** to exit the command.
9. Launch PROPAGATE.
10. Select the two first columns as base solids.
11. Select the bars as detail solids.
12. Press **C** to copy as solids. Press **Enter**.
13. Select **Option 2** for all the suggestions at the other side of the construction.
14. Press **Enter** to accept.

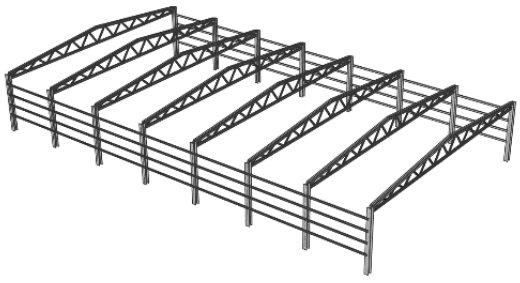






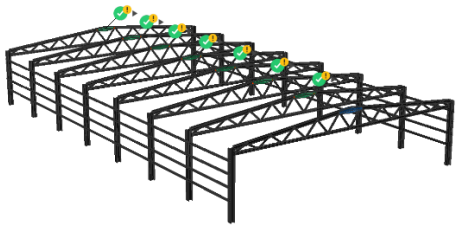


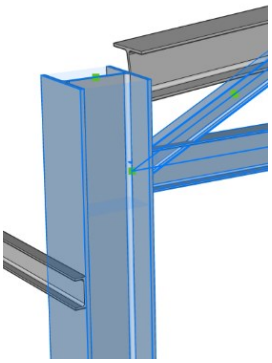


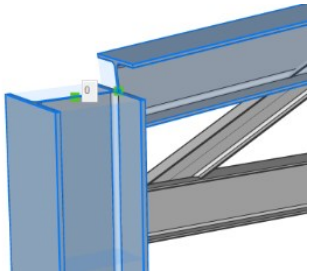


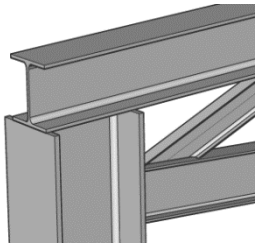
8 **Cleaning up some details**

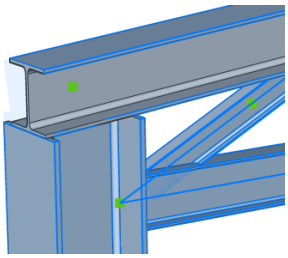
1. Show all entities again.
2. Select the two top beams of the first portal.
3. **L-CONNECT** (Quad: **Model** tab).
4. Press **Enter** to accept.
5. Launch **PROPAGATE** .
6. Select the two top beams of the first portal as base solids.
7. Press **Enter** three times to accept.
8. Select the three elements of the first portal that are indicated in the right picture.
9. **STRUCTURALCONNECT** (Quad: **Model** tab).
10. Select the column and top beam of the first portal.
11. **L-CONNECT** (Quad: **Model** tab) them like on the picture to the right by pressing **Ctrl** two times during the command.
12. Launch **PROPAGATE** .
13. Select the elements as in the right-hand picture.
14. Press **Enter** three times to accept.

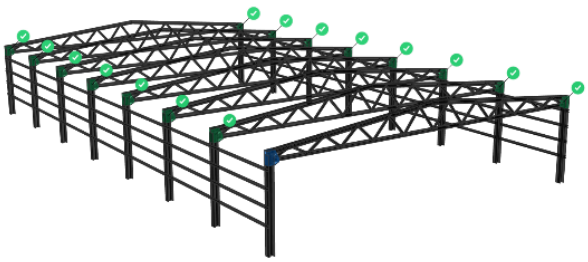






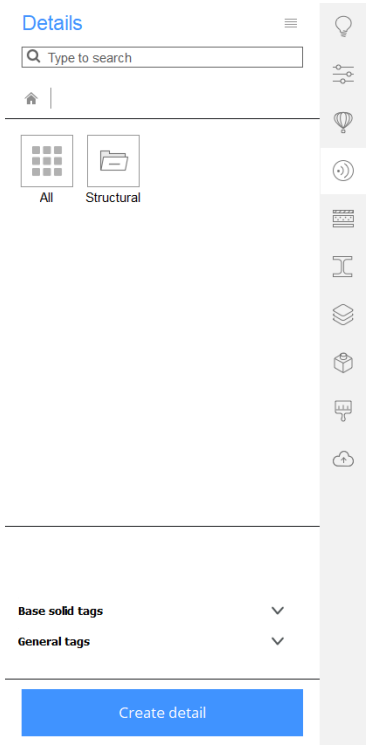






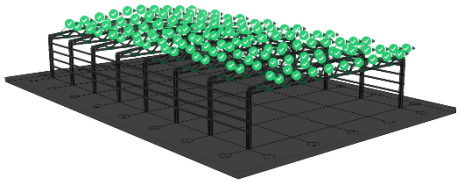
9 Add details to the details library

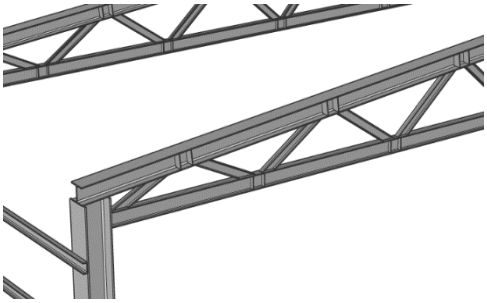
1. Unzip the folder **DetailsStructural.zip**.
2. Go to **Manage libraries** under the hamburger menu in the **DETAILS PANEL** .
3. Click the three dots and choose the unzipped **DetailsStructural** folder.
4. Close the settings.
5. Now you should see a thumbnail of the Structural folder in the Details panel.



10 Detail the truss connections

1. Drag and drop the detail **TrussConnection** from the **DETAILS PANEL** (in the **Structural** folder) to your workspace.
2. Click **Enter** to accept.
3. The trusses are now nicely detailed.

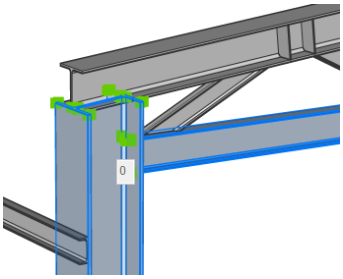




11 Creating a more detailed connection

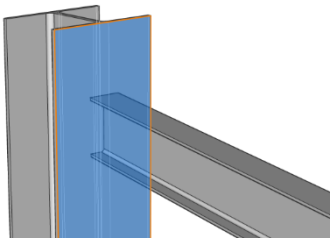
BricsCAD BIM is not a structural detailing and calculation software, however, it is still possible to create steel connections using a combination of direct modeling and our library of mechanical parts. To be able to work properly on a connection detail, there are a few things we need to do first:

1. We need to add the standard mechanical parts to the **COMPONENTS**

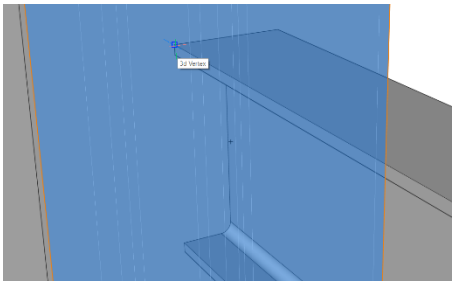


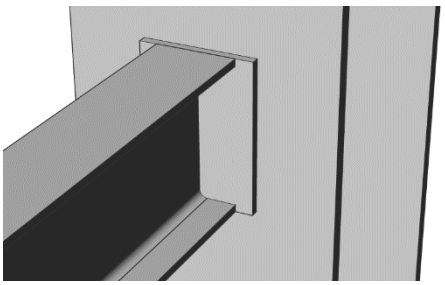
PANEL . You do this by going to the **DROPDOWN MENU** on the top right side of the panel and making sure the option *Bricsys Design Library* is turned **on**.

2. Let's design the connection between a beam and the flange of a column using an end plate bolted to the column. We'll **ISOLATE** the beam and the column so it's easier to see what we're doing (see image).



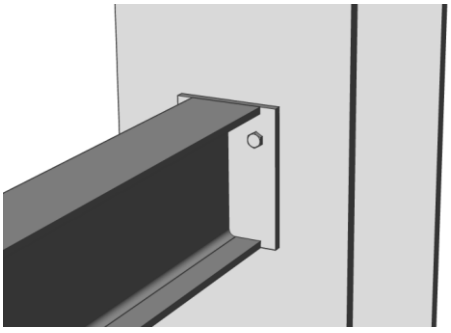
3. First, we'll create an endplate, welded onto the beam. Start the **BOX** command and hover the cursor over the side face of the column. Then press **Shift** once, so that this side face is highlighted in blue (see image). Start in the outer corner of the beam as shown in the image, and then click the opposite outer corner. Give the plate a thickness of **10** mm**,** so we end up with something like is shown in the fourth image.





4. **PUSH/PULL** the vertical sides of the plate outwards by **20** mm.

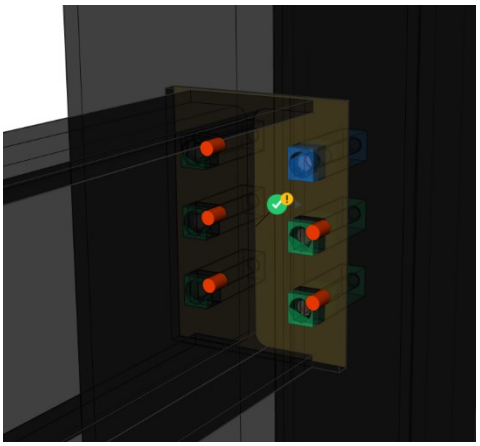
5. Open the **COMPONENTS PANEL** and go to *Standard Parts* > *BOLT* > *HEX HEAD* > *ISO.*



6. Drag the **ISO 4015** onto the plate and position it precisely using the Dynamic Dimensions. Remember, you can press **Tab** to switch between dimension field.

7. Give it a distance of **30 mm** from the side, and **55 mm** from the top of the plate.

8. We'll use the propagate tool to distribute more bolts over this plate evenly. Highlight the plate, and in the Quad under the **Model** tab, click **PROPAGATE**



9. Select the bolt as the detail objects and press **Enter**.

10. Press **Enter** again to accept the suggestion. Now a blue question mark should appear. Click it and it turns into a green checkmark.

11. You can edit this suggestion by hovering over the checkmark and clicking *Grid.*

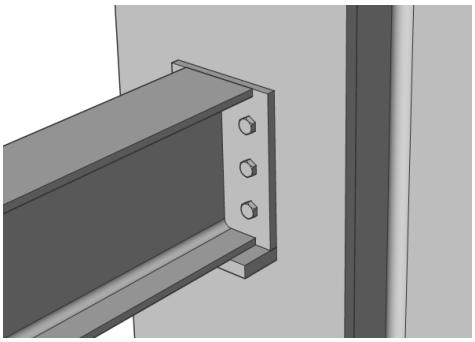
12. Add one row, so you end up with a suggestion as shown in the image. Press **Enter** to accept the suggestion.

13. To finish this detail, we will create a little plate, welded onto the column

beforehand, on which our beam can rest during the construction phase of the steel structure.

14. **EXTRUDE** the bottom face of the endplate with a distance of **15** mm.
15. **PUSH/PULL** the front face of the new plate by **40** mm.
16. We can now give the elements a correct classification. Highlight the plates and in the Quad under the **BIM** tab, click **CLASSIFY MANUALLY**. In the pop-up menu select **Plate** from the *Building Structure Elements* drop-down. Select all the bolts and classify them as well, this time select **Mechanical Fastener**.
17. The last thing we want to do is classify the entire bolted plate as a building element. So select the plates and the bolts and in the Quad under the **BIM** tab, click **CLASSIFY MANUALLY**. Choose **Building Element** and check **Convert to block and classify the block reference**. Give in a name for the block and click OK.

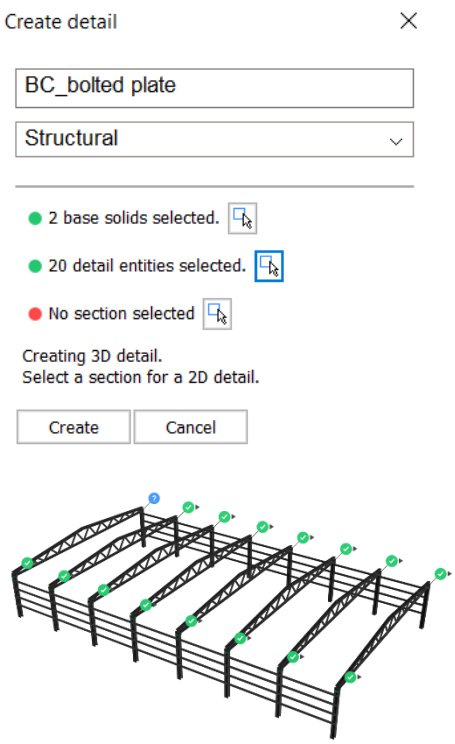
The result looks like in the picture to the right.



12 Saving and propagating a detailed connection

We can again use the **DETAILS PANEL** to save this detail and then copy it over to the rest of the drawing.

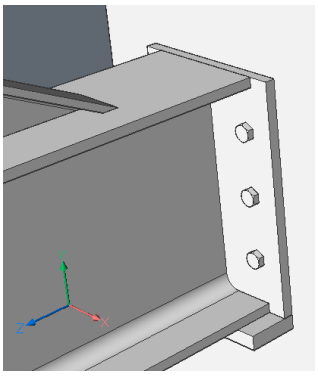
1. Click on the **Create Detail** button.
2. Give it the name *BC_bolted plate* (BC for BeamColumn) and the category *Structural*.
3. Select the column and the beam as base solids.
4. Select the block as detail solids.
5. Don't select a section element, as this will allow us to create a 3D detail.
6. Click onto the **Create** button.
7. Press **Enter** to accept the detail.
8. Edit the thumbnail by pressing the pencil icon, if you don't like the current preview.
9. Click the **Save** button.

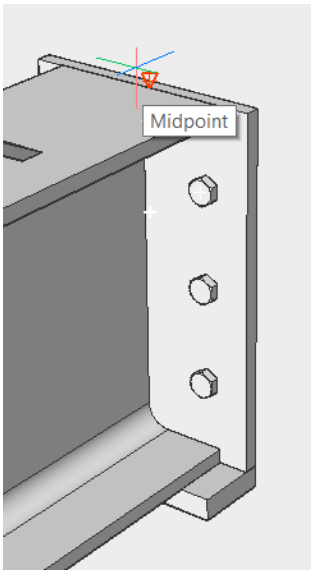


10. In the Quad under the **General** tab, click SHOW ENTITIES.
11. Drag and drop the detail you just created into your drawing.
12. You should see suggestions as shown in the image.
13. Turn the question mark in a checkmark and press **Enter**, to propagate this detail.
14. Now this detailed connection has been propagated to every possible location in your drawing.

13 (Optional) Changing the blocks so that no interferences occur

1. Revert to the file we had at the end of step 11 or go to intermediate file **Structural_13.1_optional.dwg**.
2. Now EXPLODE the block that we created at the end of step 11 and create a component from the elements instead.
3. First, we need to change the UCS however to the inside face of the flange of the column, so that our component will be defined as laying flat on this face.
4. To do that type in UCS and type **F** to select a face. Select the inside face of the flange. Make sure to enter the face from the left-hand side while selecting it, so that the UCS is turned as in the image to the right. Press **Enter** to accept.
5. Now select the block with the plate and bolts and convert it into a component by typing in BMFORM.
6. Choose the **midpoint** of the upper edge (near the column) of the bolted plate, as specified on the image to the right, as an insertion point.
7. Give in a name for your component and press **Enter**.
8. CLASSIFY MANUALLY this newly created component as **Building Element**.
9. Set your UCS back to World by typing UCS and hitting **Enter** to accept the **World** Coordinate System.
10. Now repeat step 12 with the component instead of the block.

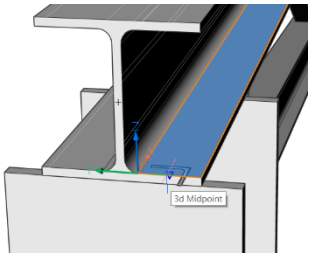


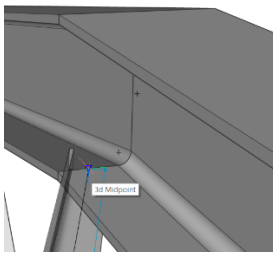


11. (Optional) Run the **INTERFERE** command to check the amount of interferences in the drawing. Select all solids for the first set and check against this same first set for the second set.. **192 solids interfere**. These are of course the bolts and the plates/columns that interfere. We will solve this issue now by replacing the components we just created by one that you can find in the starter files.
12. (Optional) **UNDO** step 13.11.
13. Select all the **Building Element** entities in the Structure Browser. There should be 16, namely the components we just created.
14. Choose **REPLACE** from the **Model** tab in the Quad.
15. Press **Enter** to choose **from a file**.
16. Choose **BoltedPlate.dwg** as source file.
17. Select all the **Building Element** entities again and now choose Update from the **Model** tab in the Quad.
18. As a result there should now be temporary holes in your columns if you hide the updated components. These holes will be gone again if you delete the components.
19. Now go to your layers. You will see a new layer called the **BC_Subtract layer**. It is this layer that contains the solids that create temporary holes once inserted into another entity. To not see these solids (and just see the holes), **hide** and **freeze** the layer.
20. Now run the **INTERFERE** command again and see that the solids don't interfere anymore, due to the newly created temporary holes!

14 (Optional) Creating diagonal braces

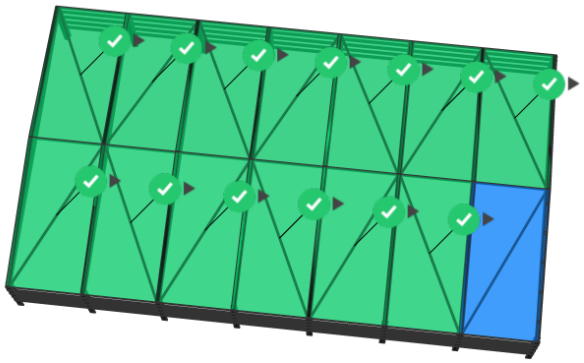
1. To let our structure resist wind forces, we can create some diagonal braces in the roof.
2. Do this by drag and dropping the **Euro L 35X35x5** profile into empty model space. Draw diagonally from the second portal beam to the first. Lock the face of the flanges and snap to the points as indicated on the images. **Q**uarter turn,





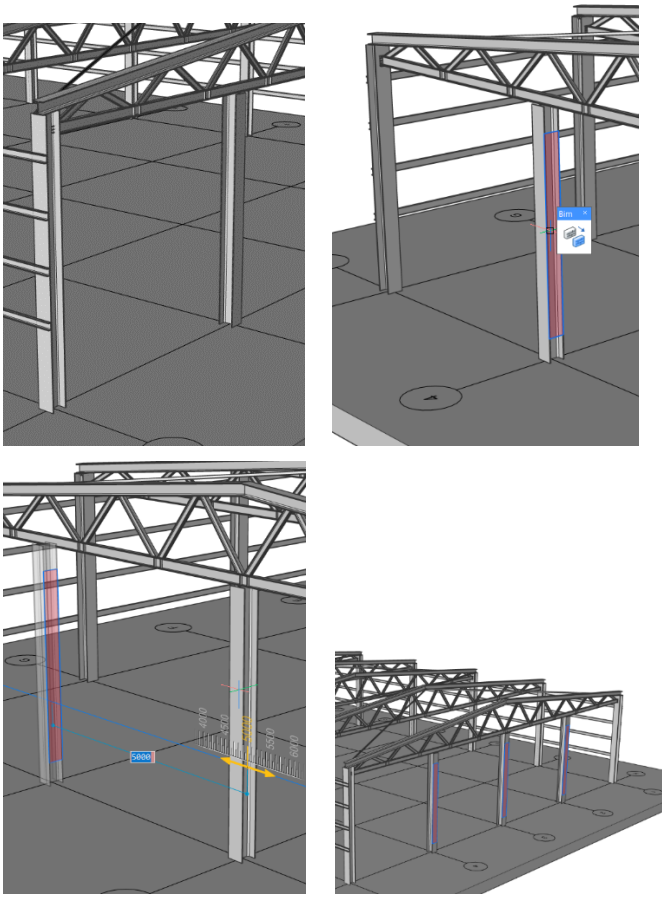
after the first click, to get the right orientation of your profile.

3. ADD ECCENTRICITY to the brace, moving it up, so that it doesn't cross the flanges of the beams anymore.
4. Move the ends of the brace by grabbing the grip points and make sure the ends don't stick out anymore.
5. Launch PROPAGATE. Select the two top beams as base solids and the brace as detail solid.
6. Type **C** for creating copies. Press **Enter**.
7. Check all the suggestions as specified on the image.
8. Press **Enter** to accept.



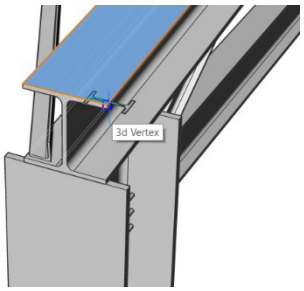
15 (Optional) Setting extra columns in front and back portal

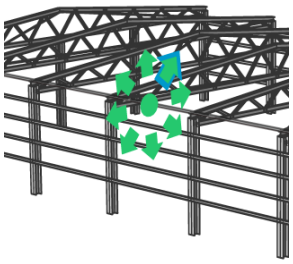
1. To be able to mount an exterior facade onto our steel structure, we will complete our model with some extra columns in the front and back portal.
2. Open the PROFILES PANEL. Search for **300** in the *IShape* category. Drag and drop the **EURO HEA 300** onto empty model space.
3. Snap to the intersection of the grid lines underneath the front portal. Turn the profile just like in the picture to the right and draw upwards with **4480** mm.
4. To copy the columns more easily, turn **on** the display of sides and ends of linear solids in the ribbon (can also be changed by typing in DISPLAYSIDESANDENDS**).**
5. Highlight the side of the column and select BIM COPY from the **Model** tab in the Quad. Type in **5000** mm for the copy distance. Press **Enter**. Type in **5000** mm again, for the next column. Press **Enter** twice to exit the command.
6. You now have three columns in the front portal.
7. Select the fronts of the three columns and choose BIM COPY from the **Model** tab in the Quad. Type in **35000** mm for the copy distance. Press **Enter** twice to exit the command.



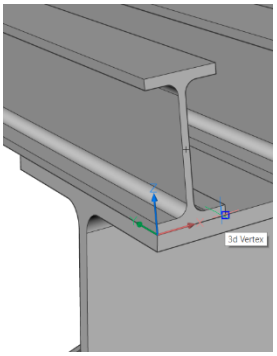
8. You now also have three columns in the back portal.

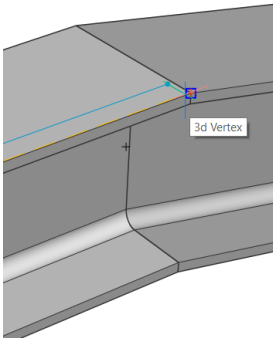
15 (Optional) Creating cross-beams



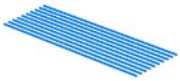


1. To be able to mount a roof on top of our steel structure we will create some cross-beams on top of the roof.
2. To work more easily, turn **off** the display of sides and ends of linear solids in the ribbon  (can also be changed by typing in DISPLAYSIDESANDENDS**).**
3. Open the PROFILES PANEL  . Search for **80** in the *IShape* category. Drag and drop the **EURO IPN 80** onto empty model space.
4. Lock the top face of the first sloped beam (by hovering over it and hitting) and snap to the vertex displayed on the image.
5. Enter a distance of **35100** mm or snap to the endpoint at the back portal. Click **Enter** to exit the command.





6. ADD ECCENTRICITY  (**Model** tab of the Quad) to your beam. Click on the up to right side arrow of the green widget.
7. We will now use an array to array this cross-beam over the roof.
8. First, adjust your UCS to the top face of the sloped beam by typing in UCS in the command line. Type **F** to select a Face. Select the top face of the sloped beam. Hit **Enter** twice to accept.

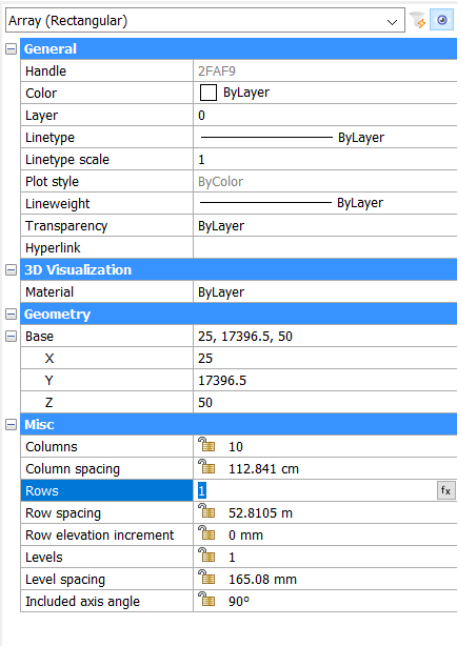


9. Select RECTANGULAR ARRAY  from the **Draw** tab of the no-selection Quad. Select the cross-beam to be arrayed.
10. Type in **COL** for Columns. Give in **10** for the amount of columns. Type in **T** to give in the total distance between start and end columns. Click on the point specified in the image to the right to start measuring the distance. Click on the second point specified in the image on the right to stop measuring.
11. Press **Enter** to exit the command.
12. We now have too many rows.

13. If we select the array and go to its properties in the **PROPERTIES PANEL**  we can see that the array has parameters. One of them is *Rows*. Put this value onto **1** and we have the array that we need.

14. Put your UCS back to World by typing in **UCS** and hitting **Enter** to accept the default value of *World*.

15. Mirror the array along the centerline of the grid by typing in **MIRROR** in the command line and clicking two points on the centerline of the grid. Type **N** and hit **Enter** for keeping the original entities.



3D constraints and parameters

You will learn to understand and use 3D constraints and parametric expressions.

1 **Open a new drawing.**

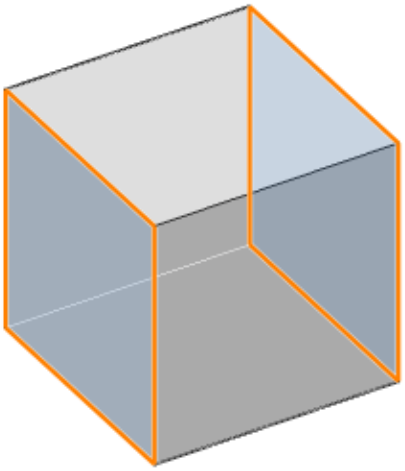
Before drawing anything, open the Parameters and Constraints panel $f(x)$ on the right side of your screen.

If you cannot find this panel, right-click anywhere in the ribbon and under Panels, enable *Parameters and Constraints.*

This panel will display all your constraints and parameters. As the drawing is empty, of course the panel doesn't show anything. For this section, we will shorten the name to *Parameters Panel*.

(Optional) Turn off boundary detection and turn on face detection: 

2 **Making parametric geometry**



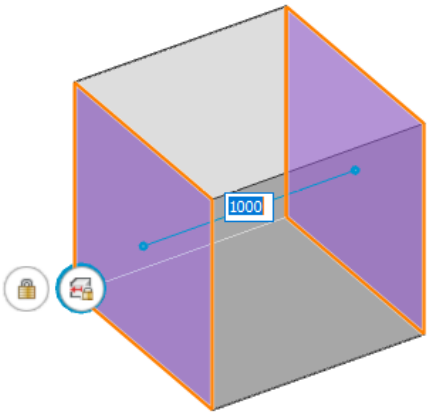
1. Draw a box of **1000 x 1000 x 1000**.
2. In the ribbon, click the *Parametric* tab. Here you will find commands to add constraints to your drawing, both in 2D and 3D. Alternatively, some of these commands can be found in the Quad.
3. Select the two faces highlighted in the image on the right
4. Quad select **CONSTRAINTS: ADD DISTANCE** 
5. Press **Enter** to accept the value of 1000
6. Now the Parameters Panel should show one Distance Constraint with a value of 1000. Right-clicking it and clicking **'Animate'** will give you an idea of what this constraint does exactly.
7. So this distance constraint controls the distance between these two faces. But which of the two faces will move when changing this constraint value? Right now there is no way of knowing, so we'll add a fixed constraint
8. Select one of the two faces, and Quad select **CONSTRAINTS: ADD FIXATION** 

   This new constraint should appear in the Parameters Panel as Fix_2. This fixed constraint will mean that **this** face will not shift; changing the Distance_1 value

will make the **other** face move further or closer.

9. Select this face again. You should see two little icons appear. These show the constraints that are currently active on this face. Clicking on one of the icons will also highlight the associated constraints in the Parameters Panel.

10. Select Distance_1 in the Parameters Panel, and change its **'Expression'** field to another value (e.g. 800); you will see the opposite face shift so that the distance is now 800. Alternatively, you can click the editable dimension that is shown, and change its value there, see image on the right.



3 **Some more constraints**

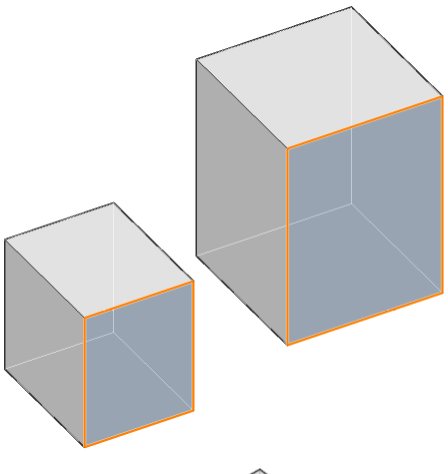
1. Draw another box next to the original one

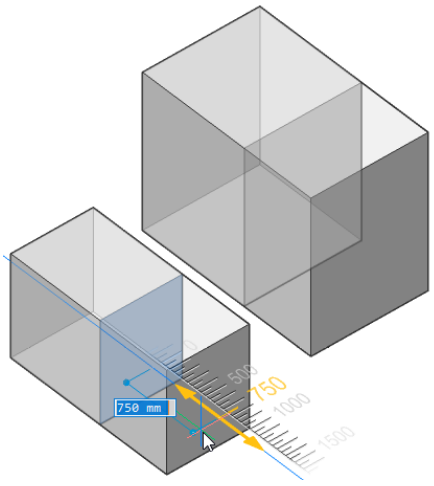
2. Select two parallel faces: one of each box (see image)

3. Quad select **CONSTRAINTS: RIGID SET** 

4. A rigid set means the (sub)entities in this set will remain rigid with respect to each other. In this case this means the faces will always remain the same distance to each other.

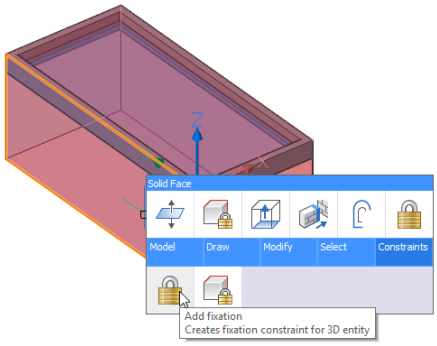
5. This can be illustrated by using **PUSH/PULL**  on one of these faces. You will see that the other face in this rigid set will also move along (see second image).





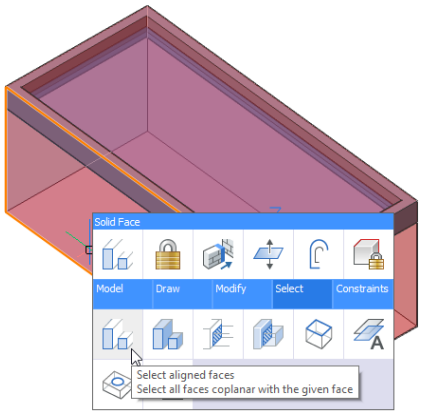
4 **We'll parametrize an existing component.**
Open **My Window.dwg.**
The parameters we want to control are the total Height, total Width, and the thickness of the frame. Make sure the Parameters Panel is open.

5 **First, let's create some fixed constraints. These make sure the selected faces will stay in the same plane at all times.**



1. Select left surface of subtractor box (make sure you select the surface and **NOT** the boundary)
2. Quad select **CONSTRAINTS: FIXATION** (appears in Panel as "Fix_1")
3. Select short, front surface of subtractor box
4. Quad select **CONSTRAINTS: FIXATION** (appears in Panel as "Fix_2")

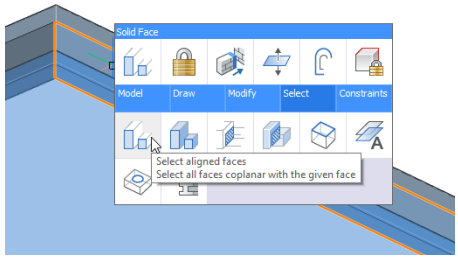
6 **Now we'll create some Rigid Set constraints. These make sure that all entities inside this set remain in the same position with respect to each other.**



1. Highlight one of the side faces of the subtractor solid
2. Quad select **SELECT ALIGNED FACES** in the **select** tab
3. Now you should have two faces selected: the side face of the subtractor solid, and the side face of the frame
4. Quad select **CONSTRAINTS: RIGID SET**

   This rigid set will make sure these two faces remain coplanar.
5. Repeat process for the other three sides. You should see each of these constraints appear in the Parameters Panel.

7 **We'll want to do the same for the *inside* of the frame.**

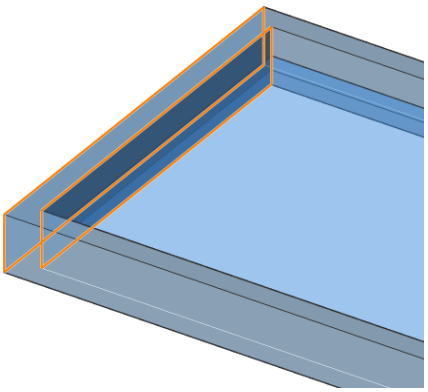


1. Turn off **"BIM_Subtract"** layer
2. Highlight one of the inside faces of the frame
3. Quad select **SELECT ALIGNED FACES** in the **select** tab
4. You should again have two faces selected: the inside face of the frame, and the side face of the glass pane.
5. Quad select **CONSTRAINTS: RIGID SET**

6. Repeat process for other three sides.
7. If all steps were followed correctly, you should now have 2 fixed constraints and 8 rigid sets in the Parameters Panel, each containing two faces.

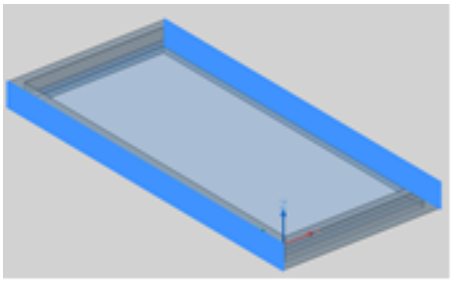
8 **Time to add some distance constraints. Two faces that are linked by a distance constraint will always be that distance apart.**

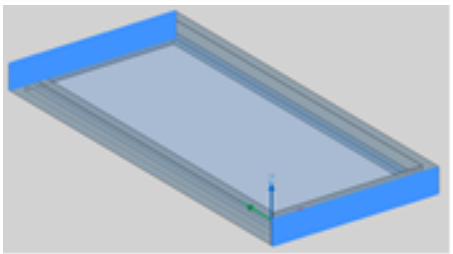
The first thing that we'll be handling is the frame thickness.



1. Select the **inside** and the **outside** faces of one end of a frame (see image):
2. Quad select **CONSTRAINTS: ADD DISTANCE** 
3. Dimension will appear, just press enter *(Distance_11 = 40 should appear in Panel)*
4. To check which faces a distance constraint controls, right-click it in the Parameters Panel and click **'Animate'**. You should now see the thickness of this side of the frame change.
5. Repeat this process for the other three sides.

9 **Now we'll add overall distance constraints.**





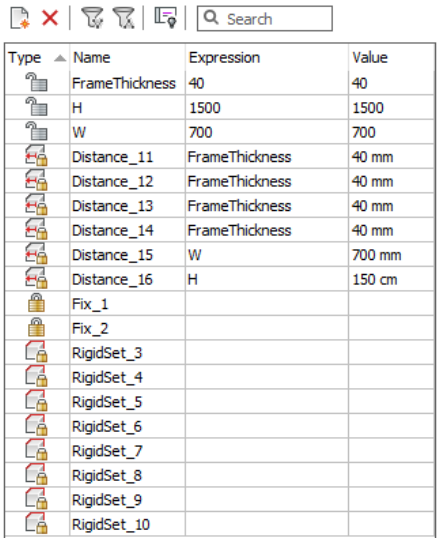
1. Select the two opposite **outer** faces of the window frame (see figure)
2. Quad select **CONSTRAINTS: ADD DISTANCE** 
3. Dimension will appear, just press enter *(Distance_15 = 700 should appear in Panel)*
4. Select window frame bottom outer end surface and top outer end surface (see figure)
5. Quad select **CONSTRAINTS: ADD DISTANCE** 
6. Dimension will appear, just press enter *(Distance_16 = 1500 appears in Panel)*
7. To check whether all the constraints were applied correctly, try to **animate** these last two distance constraints. If all went well, the height and width of the window should change, while the frame thickness stays the same. Also the glass pane and the subtractor solid should move along with the animation.

10 Creating Parameters

1. At top of the Parameters Panel, click the **New** icon. A new parameter will be created.
2. Select new parameter, and change name to **"W"**
3. Change Expression to **700**
4. Create a new parameter
5. Select new parameter, and change name to **"H"**
6. Change Expression to **1500**
7. Create a new parameter
8. Select new parameter, and change name to **"FrameThickness"**
9. Change Expression to **40**

11 Applying parameters

1. In the Parameters Panel select the distance constraint with value **700**
2. In expression field, type **"W"** *(use same syntax as parameter name),* press **Enter.**
3. Select the **distance constraint** with value **1500**
4. In expression field, type **"H"** *(use same syntax as parameter name),* press **Enter.**
5. Select the **distance constraints** with value **40**
6. In expression field, type **"FrameThickness"** *(use same syntax as parameter name),* press **Enter.** You will have to do this individually for all four distance constraints
7. In the end, the Parameters Panel should look similar to the image on the right.



12 Checking parameters

1. In Parameters Panel, right-click **W** and click **'Animate'**. Does it do what you expect?
2. You can now change the values of **W, H** and **FrameThickness** before saving the file.
3. You can now save this component in your library by opening the Components Panel and clicking **CREATE COMPONENT**. After dragging and dropping this new window into another drawing, you will see these parameters

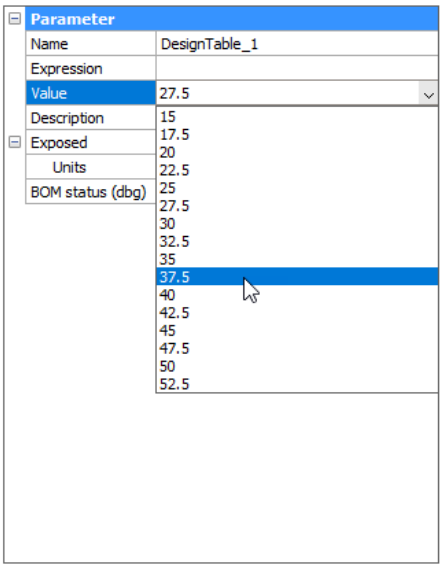
W, H and **FrameThickness** show up in its properties, allowing you to change the appearance of this window after inserting it.

13 Using design tables

Currently this window can be created in all possible sizes, from miniscule to supersized to having odd sizes. In practice usually the allowed sizes of an object will be limited to certain parameter combinations due to manufacturing constraints.
We can create design tables that impose these restrictions up front. Let's start with creating a design table for the frame thickness.

1. Open the *Mechanical Browser*  on the right side of your screen. Note that this browser also displays the constraints and parameters that we created earlier
2. Right-click the **FrameThickness** parameter and click **Create design table.**
3. Currently the design table is empty. The easiest way to configure this design table is in a spreadsheet editor. Right-click the design table and click **Export.**
4. Save it as a .csv file somewhere easily accessible, and open this .csv file with a spreadsheet editor like Excel.
5. The .csv file has two empty columns. The left-most column (*DesignTable_1*) will contain the names of the possible configurations, whereas the right-most column (*FrameThickness*) will contain the possible values of the **FrameThickness** parameter. In this simple case having both columns the same would make the most sense (i.e. the name of the configuration equals the value that the parameter will be). Fill in some values that make sense, for example as shown in the image on the right. This will mean that the frame thickness can only be chosen between **15 mm** and **52.5 mm** in increments of **2.5 mm**.
6. Save the .csv file and go back to BricsCAD and in the Mechanical Browser, right-click **DesignTable_1** and click **Replace**. Now select the file you just edited.
7. Select the design table and under Parameter you can now change its **Value** to any of the values you included in the .csv files.
8. (Optional) turn its **Exposed** property to **Off.**

DesignTable_1	FrameThickness
15	15
17.5	17.5
20	20
22.5	22.5
25	25
27.5	27.5
30	30
32.5	32.5
35	35
37.5	37.5
40	40
42.5	42.5
45	45
47.5	47.5
50	50
52.5	52.5

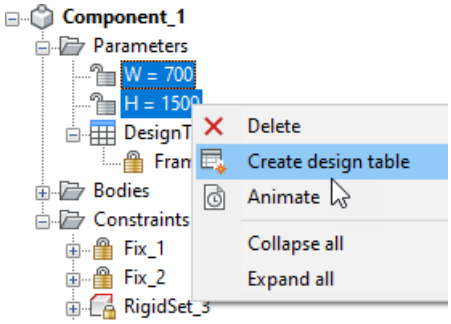


14 Combining multiple parameters in a design table

It is possible to combine more than one parameter in a design table. For example, maybe there are only certain combinations of Width and Height of the window possible. You can define these combinations in a design table.

1. Select both **W** and **H** parameters (by holding down **ctrl** and left-clicking them both), right-click and choose **Create design table**.
2. Using the same steps as before, we can export this design table and open it in a spreadsheet editor. Now the file contains three columns: one for the names of the configurations, and two for the parameter values for **W** and **H**.
3. Fill in some values that make sense, as shown in the image on the right. Thus, only the combinations of **W** and **H** that are listed in the .csv file will be possible.
4. Back in BricsCAD, replace **DesignTable_2** by the .csv file you edited. Now under Parameter you can change the **Value** to any of the preset combinations.
5. Rename **DesignTable_2** to **Window Size**.

You can now save this component in your library by opening the Components Panel and clicking **CREATE COMPONENT**. After dragging and dropping this new window into another drawing, you will see the parameters **FrameThickness** and **WindowSize** in the component's properties. Now you can easily select the sizes of these two parameters from the drop-down list that appears.



DesignTable_1	W	H
600 x 1200	600	1200
600 x 1400	600	1400
600 x 1800	600	1800
600 x 2000	600	2000
800 x 1200	800	1200
800 x 1400	800	1400
800 x 1800	800	1800
800 x 2000	800	2000
1200 x 1200	1200	1200
1200 x 1400	1200	1400
1200 x 1800	1200	1800
1200 x 2000	1200	2000

15 Parametrizing an object automatically

After parametrizing this window object, you might agree that constraining and parametrizing an object is not straightforward. Luckily there is a command that will do most of the work for us.

1. Open **Chair.dwg**
2. In the Parameters Panel you can see that there are no parameters or constraints in this drawing.
3. Select the chair **solid**
4. Launch the **PARAMETRIZE**  tool (Quad: in the **Constraints** tab)
5. The Parameters Panel now shows a set of parameters and constraints that were automatically defined.

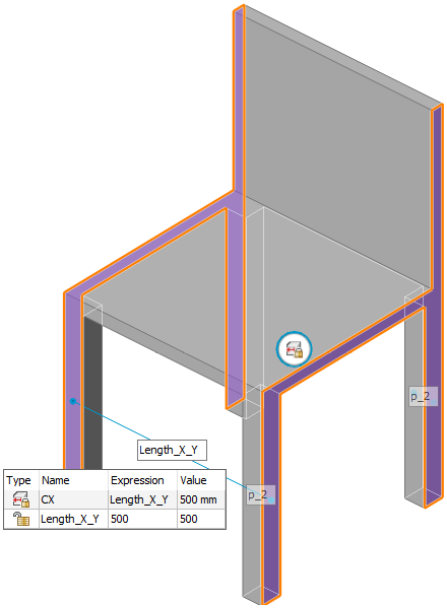
6. Animating each of these parameters lets us understand what they do exactly:

   Length_X_Y changes the width and depth
   Length_Z changes the overall height
   p_1 controls the seat thickness
   p_2 controls the leg thickness
   ratio_1 controls the ratio between seat height and overall height.

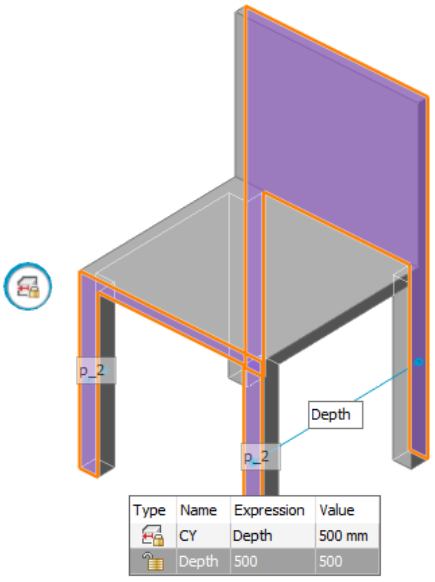
16 **Changing the parameters and constraints**

This first suggestion of parameters and constraints is very useful, but maybe we want to define our parameters differently. For example, we want our width and depth of the chair to be controlled by two separate parameters, instead of one combined parameter **Length_X_Y**:

1. Close the Parameters Panel
2. Select one of the side faces of the chair
3. A distance constraint icon should show. Click it.
4. Now two editable dimensions should be visible: click the one that says **Length_X_Y**
5. A parameters manager pops up, showing the expression of this distance constraint, and the value of this expression. This is actually a subset of the Parameters panel, showing only the constraints and expressions that are relevant in this situation. If the parameters panel were open at that time, this floating manager would not appear.
6. We want this distance constraint to be controlled by a new parameter: right-click the parameters manager and click **'New'**
7. Give the new parameter a name (e.g. **'Width'**) and an expression (e.g. **500**)
8. Now change the Expression of the distance constraint (the top row in this parameters manager) to be this new Parameter 'Width'.
9. We can again animate this parameter to see whether our changes were correct.
10. Select the front face of the chair, and click the distance constraint icon.
11. Open the parameters manager by clicking the editable dimension that says **Length_X_Y**



Type	Name	Expression	Value
	CX	Width	500 mm
	Length_X_Y	500	500
	Width	500	500

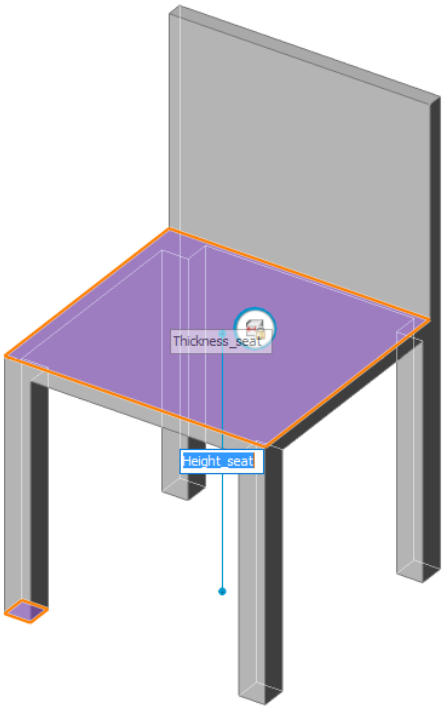


Type	Name	Expression	Value
	CY	Depth	500 mm
	Depth	500	500

12. Change the name of **Length_X_Y** to **Depth**
13. **Note:** all of the steps in this section could also have been done using the Mechanical Browser. However the method explained here is a more visual method, easier to understand.

17 **In this section we'll let the height of the chair be controlled by two absolute value parameters instead of an overall height and a ratio.**

1. Select the top face of the chair seat
2. Click the distance constraint icon, and then the dimension that gives the distance between the top face of the seat and the bottom face of one of the legs
3. We see that the height of the chair seat is controlled by an expression: the overall height of the chair (Length_Z) multiplied by a certain ratio (ratio_1). This is a rather confusing way to represent this height, so we'll create a new parameter: **'Height_seat'** with a value of **480**
4. Now change the expression of the distance constraint to be this new parameter Height_seat
5. Select the top face of the chair backrest
6. In the parameters manager, change the name of **Length_Z** to **Height_backrest**
7. Animate these two parameters to check the results.
8. **Note:** The parameter **ratio_1** has now become obsolete; it is no longer used in any expressions, so we can delete it.



18 In a final step, we can rename the parameters **p_1** and **p_2** to have more appropriate and recognizable names. In this case, **p_1** could be renamed to **Thickness_seat**, and **p_2** could be renamed to **Thickness_leg**. This way, the parameters are more easily recognizable when editing the chair's dimensions.

Drawing documentation advanced

This module explains how to advance your sheets and schedules and how to use templates to customize your future generated drawings.

1 **Open starter files**

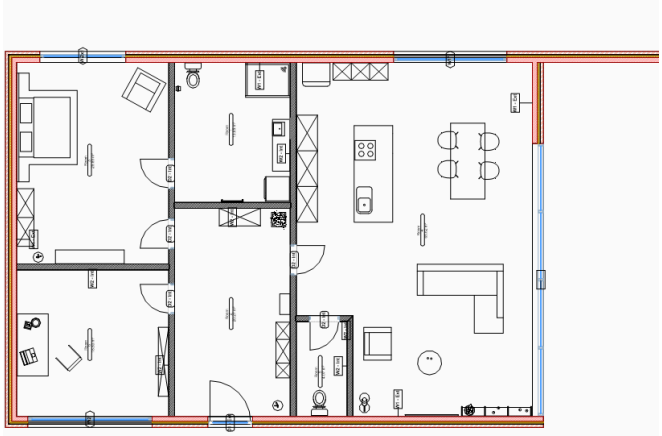
1. To begin, open the following file: **Master.dwg** from the Exercise folder in the 'Drawing documentation advanced' folder. This project is the project we made during the 'Drawing documentation basic' module.

2 **Open the Project Browser**

1. The **PROJECT BROWSER** should be populated with a set of 12 sections, 6 sheets, and 3 models.
2. Inside the project folder, you will find an extra file: a **.projectroot file**. This file links together all of these drawings and sheets. In the following sections, we will keep using the Project Browser to navigate and manage our project and the associated documentation.

3 **Check generated drawings**

1. To see the result drawing of the section Ground Floor, right-click **Ground Floor**, and select **Display View** in the flyout menu.
2. The floor plan displays the cut through representation of the windows and walls, with different hatches for each ply of the wall, as well as the furniture symbols and some automatically placed tags. We will discuss in detail how these different elements are created in the next steps of this module.

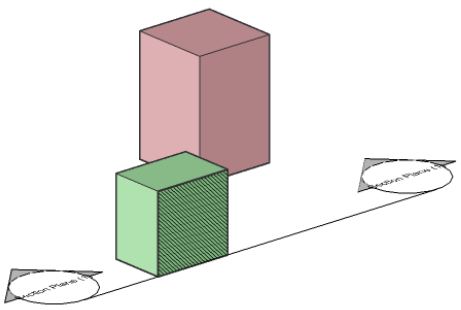


4 **Understanding the layers that were created**

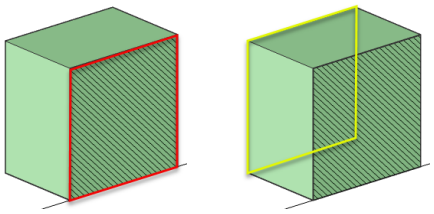
If you take a look at the **LAYERS PANEL** in the **Ground Floor** drawing, you will find that an entire set of layers was created to structure this drawing. They are mainly grouped into three groups: *Background, Boundary* and *Fill.*

The way this is set up is as follows:

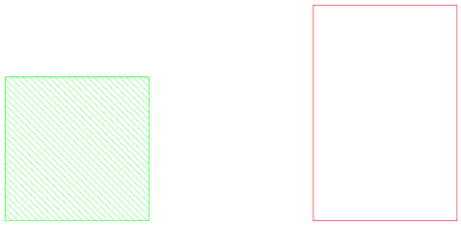
1. Imagine having two objects in your 3D model, each on their own layers: **Layer1** and **Layer2.**
2. A section plane is cutting *through* the object on **Layer1** (the green object in the image on the right). The section plane is *not* cutting through the object on **Layer2** (red object in the image).



3. In the resulting section drawing, some layers will be created for the green object: **Boundary_Layer1** for the boundary of where the section plane slices through the object (indicated with a red line in the image on the right). A **Fill_Layer1** layer will be created containing a hatch of where the section plane cuts through the object. Finally, a **Background_Layer1** layer will be created that contains subentities (e.g. vertices of solids) that are **not** sliced by the section plane: in this case, the vertices indicated with a yellow line in the image on the right.



4. For the red object, only **one** layer will be created. Since the section plane does not cut through this object, only a **Background_Layer2** layer will be created. Thus, the section result will look like the image shown here.



5. This logic is extended when a physical material is assigned to an object. Take a look at the **COMPOSITIONS PANEL** in **Building 2.dwg**. Double-click *Cavity Wall, Brick*, this composition consists of 4 plies, each with their own material. Each physical material is associated with a hatch pattern, which will be shown when creating a floor plan or vertical section.

6. When a physical material or composition is applied to an object, this material name will **overwrite** the name of the layer which the object is on, when creating the *Fill_, Boundary_ and Background_* layers in the resulting section drawing. So let's say you have an object on Layer **Wall**, and it has a composition that consists of two plies: **Brick** and **Insulation**. Instead of creating *Fill_Wall, Background_Wall* and *Boundary_Wall,* it will create the layers *Fill_Brick, Background_Brick, Boundary_Brick, Fill_Insulation, Background_Insulation* and *Boundary_Insulation.*

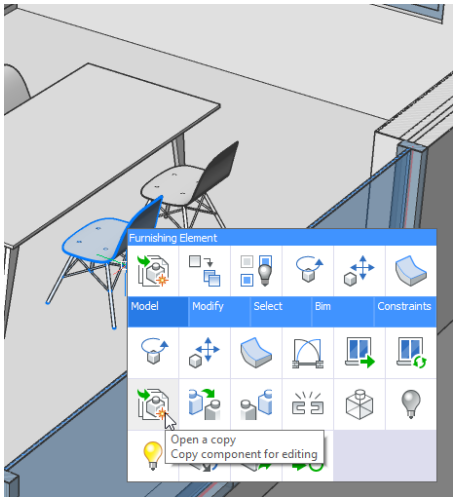
7. For objects **without** a composition, the colors of the *Fill_, Background_* and *Boundary_* layers will be copied from the layer in the 3D model. For objects **with** a composition, the default colours and line weights are set by a template found by typing in **SUPPORTFOLDER** and browsing to *Bim/Sections/_SectionSettings.dwg.* Thus, it's possible to create your own templates for material colors.

8. The way these *Fill_, Background_* and *Boundary_* layers are set up can be controlled in the drawing that contains the section planes; i.e. **Building 2.dwg** in this case. Open this drawing and type in **SECTIONPLANESETTINGS** in the command line. This will open the drawing explorer in the Section Planes tab. Here you can control per section plane how certain types of lines are plotted, and on which layer they are created. This should give you full control over which layers are created and what your generated 2D drawings will look like. We will not go into full detail here, but it is worth exploring

the different options and settings if you want to create templates for your own workplace.

5 Understanding the created BRX_2D layers

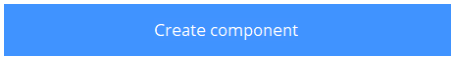
In the drawing with the generated 2D sections, open the **LAYERS PANEL**  . In the search bar, type in 'BRX'. You can see that there are a couple of so-called *BRX_2D* layers. We already met them in the 'Drawing documentation basic' module, but we will explore them further here.



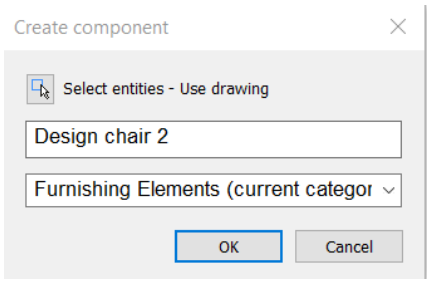
Note that objects on BRX_2D layers will only be displayed in a section result if the section plane is **parallel** to these objects.

You can create your own BRX_2D layers in custom objects, so long as they have the correct syntax: *BRX_2D_* or *BRX_2D+_* as a prefix.

1. Open **Building 2.dwg**.
2. Activate the horizontal floor plan section by double-clicking it.
3. In the dining room, highlight one of the chairs and in the Quad, click **OPEN A COPY**  .



4. In this drawing, you can see that there are a layer *BRX_2D_Symbols,* containing some polylines and splines. Thus, when creating a horizontal section, this chair will not be represented by what it looks like as a 3D model, but by the polylines and splines that are on this *BRX_2D_Symbols* layer.
5. Change the representation of the chair to your standard. Make sure to put your symbolic representation on the *BRX_2D_Symbols* layer and to **not** use regular **Lines**, as these will not be displayed upon section generation.
6. Save this copy of the component by hitting the button **Create Component**, in the **COMPONENTS PANEL**  , while nothing is selected. Give it a name, for example, **Design chair 2**, and a category, here **Furnishing Elements**.



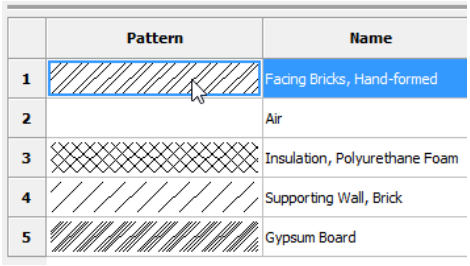
7. Go back to **Building 2.dwg**.
8. Replace the old chair with the new one by selecting the chair and clicking **REPLACE**  from the **Model** tab of the Quad. Click **Enter** to fetch the new component from a file. Browse to the *C:\ProgramData\Bricsys\Components* folder. This is the folder where new components are stored that are made via the Components Panel. If you browse to the Furnishing Elements folder, you will find the *Design chair 2* component. Select this dwg to replace the chair with.
9. Now save **Building 2.dwg**.

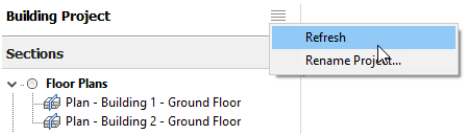
10. Click **Update** on the **Ground Floor** section in the Sheets tab of the Project Browser and then click **Display View**. You will now see that the BRX_2D_Symbol has changed to the new representation.

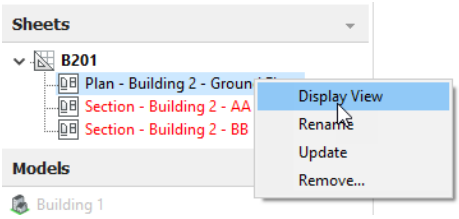
6 Updating section hatch patterns

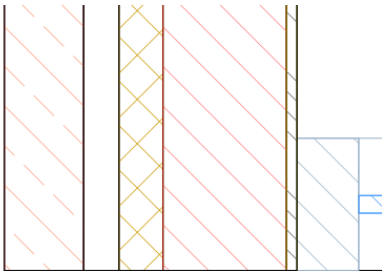
When changes are made in the 3D drawing, these changes can be easily updated in the 2D section result.

1. Open **A-100.dwg**.
2. Check out the created plan view **Ground Floor**. Notice the different hatch patterns in the section.
3. Go to **Building 2.dwg**.
4. Open the **COMPOSITIONS PANEL** and double-click *Cavity Wall, Brick*
5. Double-click the hatch pattern of the *Facing Bricks, Hand-formed*
6. In the appearance tab, double-click the hatch pattern and change it to **ANSI33**
7. Click OK to close the compositions dialog
8. Save this drawing
9. In the Project Browser, right-click **Ground Floor** and click *Display View.*
10. Right-click it again, and this time click *Update*. You should see the changes you made in the 3D model being reflected in this 2D section as well; the hatch pattern of the facing brick is updated to ANSI33 instead of the default hatch pattern.









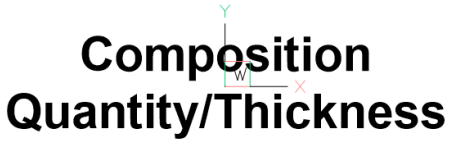
7 Tagging building elements

The command **BIMTAG** allows you to manually or automatically add tags on section results. However if the property '**Generate Tags**' of the respective section plane is on, the tagging will happen automatically upon generation of your section. Which has happened in our sections.

1. If the setting would be off though you can go to the Quad, under the **Model** tab, click **TAG** and press **Enter**.
2. You see a bunch of Multileaders on your sections. To understand which information

those Multileaders show, type **MLEADERSTYLE** in the command line. This opens up the Drawing Explorer in the Multileader Styles tab.

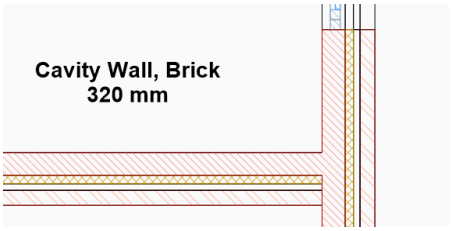
3. Select the _WallTypeStyle; it gives you a preview of what the tag will look like. We will change the tag style so it contains different information and has a different appearance
4. Change the Type from *'Straight'* to *'None'*. Now it won't have a line connecting the building element and the tag itself
5. In the *Content* tab, you see that the Source Block is called _WallTag. Close the drawing explorer.
6. In the command line, type **BEDIT** and choose to edit the _WallTag block definition
7. Select the *WallType* Attribute Definition, and in its **PROPERTIES PANEL** change the 'Tag' value from *WallType* to *Composition*
8. Copy this Attribute Definition and paste it a bit lower. Change this new Attribute Definition's Tag value to *Quantity/Thickness* (see image on the right)
9. Delete the rectangle
10. In the floating Block Edit toolbar, click the **BCLOSE AND SAVE** icon, or type **BCLOSE** in the command line and choose the Save option
11. Highlight the viewport containing the floor plan again
12. In the Quad, under the **Model** tab, click **UPDATE SECTION**
13. The wall tags should now have a different appearance: they should show the composition name as well as the thickness. The box and the leader connecting it to the building element should no longer appear.
14. **Note:** these block definitions and multileaderstyles are saved in a template drawing in the support folder. Type in **SUPPORTFOLDER** and browse to Bim/Sections/_SectionTag. Thus, it is possible to create your own templates for tag styles, using the same method as described above in the template file.



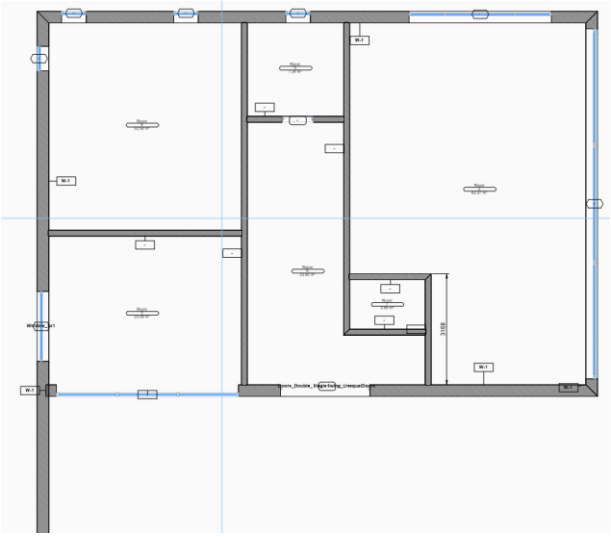
Note: the syntax to be used is as follows:

@PropCatName/@PropName. If "/" delimiter is not present in the tag, "BIM" category is assumed.

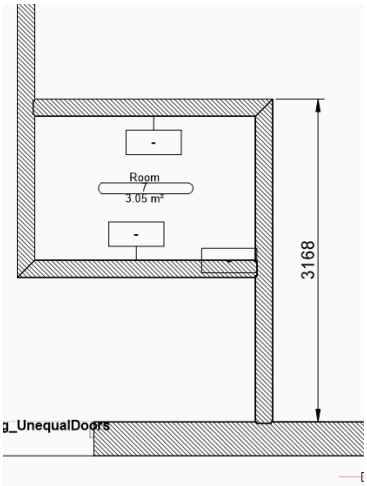
Base property name should be separated from the child name with ":" character, e.g. mass/ucs elevation:minimum.

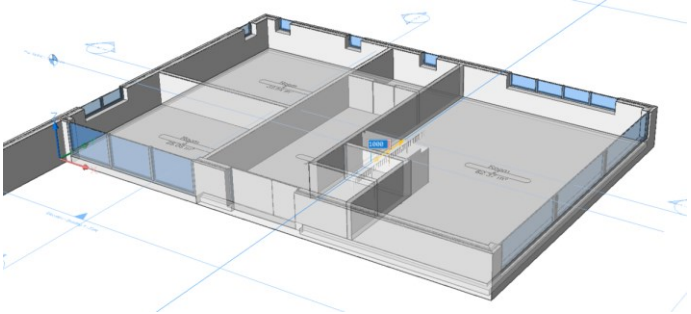


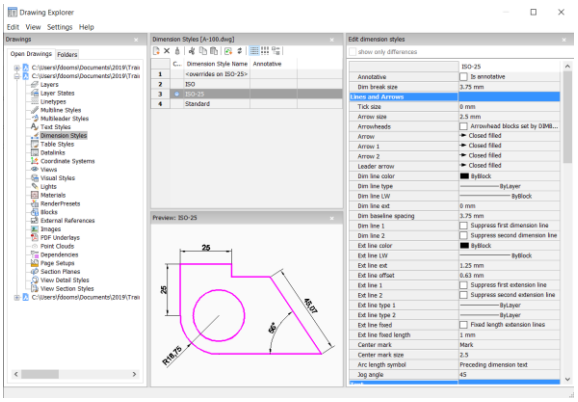
8 Adding dimensions



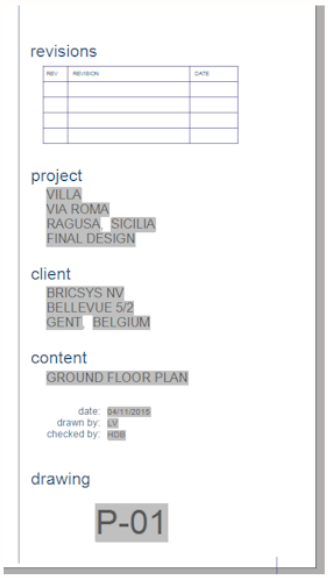
1. Open the **Plan – Building 1 – Ground Floor** section drawing.
2. Go to the **Annotate** tab and select **DIMENSION** from the Dimensions category.
3. Click a line (without snapping to a point) of the wall that is dimensioned in the image to the right.
4. Click again to place the dimension's text somewhere in the neighborhood of the wall.
5. Save the file **A-101.dwg**.
6. Open **Building 1.dwg** and clip the horizontal section.
7. Drag the wall, indicated in the picture to the right, by **1000 mm**. To do this, hover over a face of the wall and click **DRAG**  from the **Model** tab of the Quad. Then move the cursor out of the little room into the big room, type in **1000** and hit **Enter**.
8. Save **Building 1.dwg**.
9. Go back to **Plan – Building 1 – Ground Floor**.
10. Click on the viewport and click **UPDATE SECTION**  (Quad: **Model** tab).
11. The dimension line adjusted itself according to the new length of the wall.
12. If you want to add some more annotations, you can do so, but in this training, this was the last type of annotation that we discussed.
13. You can customize and save dimension styles in the **Dimensions** section of the **Drawing Explorer**. You can go there by typing in **DIMSTYLE** in the command line.
14. Note that if you want to store dimension styles for future drawings you can do so by adding them in a .dwt template file. The process of adding things to a template file will be discussed in one of the next steps.







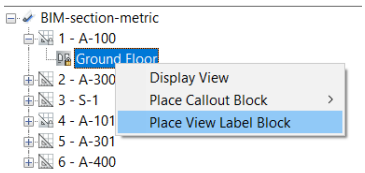
9 Inserting title blocks and sheet list tables



Sheet List	
Number	Title
1	A-100
2	A-300
3	A-301
4	A-400

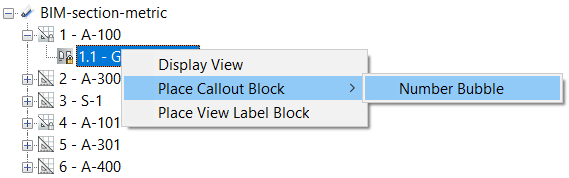
1. Go to the file **A-100.dwg**.
2. Open the **Drawing Explorer - Blocks** dialog by typing in **XB** in the command line.
3. Double click the **Title** block.
   The Drawing Explorer dialog closes and the block is attached to the cursor.
4. Click at the lower right corner of the paper sheet in the layout.
5. Define some **Project properties** in the **SHEET SETS PANEL** .
6. Save the drawing. Normally the fields are now updated automatically.
7. If the fields would not update automatically, you can go to the **Annotate** tab, select the Title block, then click the **UPDATE FIELDS** tool button ( ) in the **Text** tab under the **Fields** drop-down.
8. Now let's insert a sheet list table.
9. A **Sheet List** table can be inserted on any sheet of the sheet set.
10. Right-click the sheet set name in the **SHEET SETS PANEL** and choose **Insert Sheet List Table** in the context menu.
11. Specify a point in the drawing to place your table.
12. Fill in the numbers of the sheets by going to each individual sheet in the **SHEET SETS PANEL** . Run the **UPDATE FIELDS** command onto the table to regenerate the table.
13. Note that if you want to store the title block for future drawings you can do so by adding it in a .dwt template file. The process of adding things to a template file will be discussed in one of the next steps.

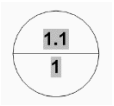
10 Adding view labels and callout blocks



1. We will start by adding a view label.
2. Go to the file **A-100.dwg**.
3. Select the sheet view **A-100** in the **SHEET SETS PANEL** and click on the plus in front of it.
4. Right-click the sheet view you want the view label block to be inserted for.
5. Choose **Place View Label Block** in the context menu.
6. Click on your sheet to specify an insertion point.
7. **Enter** to accept 1 for the Scale factor of the block.

8. **Enter** to accept 0 for the Rotation angle of the block.
9. The View Label block is inserted.
10. The Sheet Number, Sheet View Number, Sheet View Title and Viewport Scale of the selected sheet view are filled in automatically.
11. Select the sheet view **A-100** in the **SHEET SETS PANEL** and click on the plus in front of it.
12. Right-click the sheet view you want the callout block to be inserted for.
13. Choose **Place Callout Block** > **Number Bubble** in the context menu.
14. Click on your sheet to specify an insertion point.
15. **Enter** to accept 1 for the Scale factor of the block.
16. **Enter** to accept 0 for the Rotation angle of the block.
17. The Number Bubble block is inserted.
18. The Sheet Number and Sheet View Number of the selected sheet view are filled in automatically.
19. You can store the source files of various callout blocks in a template.
20. The template is located in the *..\Support\Bim\Sections* subfolder of the Roamable Root folder. By default this is: *C:\Users\<user_name>\AppData\Roaming\Bricsys\BricsCAD\Vxx\en_US\Support\Bim\Sections*. You can easily access this file by typing in **SUPPORTFOLDER** and browsing to Bim/Sections.
21. You can edit these files to customize the layout of the callouts and the section tracker blocks.
22. When a drawing is generated, the needed callout blocks are created from the callout blocks source file(s). When a BIM section is updated, the existing callout blocks in the target drawing are used (type **BEDIT** to choose one to edit).

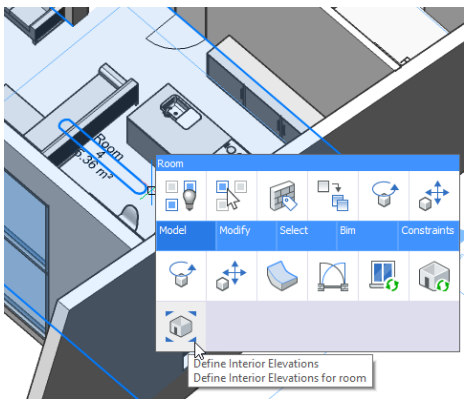




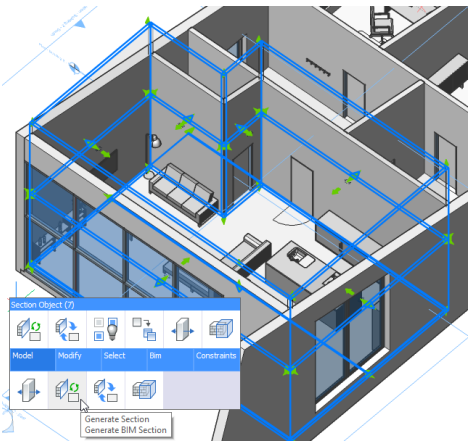
11 Creating interior elevations

If you're interested in interior elevations of a room, these can be created automatically. This can be particularly interesting for interior designers, or to make the layout of wall plugs/light switches

1. Open **Building 2.dwg**
2. Activate the horizontal plan section by double-clicking it
3. Highlight the living **Room** or select it in the Structure Browser
4. In the Quad, under the **Model** tab, click **DEFINE INTERIOR ELEVATIONS**



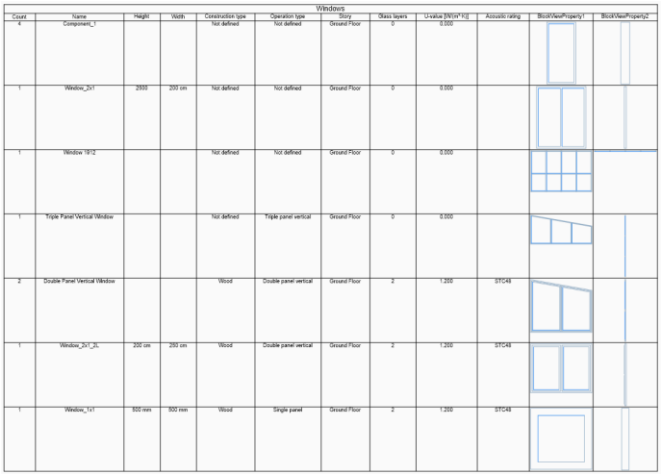
This should create an elevation for each wall, and a floor plan of this room.



5. Open the **STRUCTURE BROWSER** and under **Sections**, you should now find 6 Interior Elevations and 1 Interior Floor Plan.
6. Select all 7 of these section planes and in the Quad under the **Model** tab, click **GENERATE SECTION**.
7. You can open the section results by clicking **OPEN MODEL** while having the section planes selected, or by opening the Project Browser. This should now contain a new sheet displaying these interior elevations.
8. Rearrange the section results so that they fit on the sheet. These interior elevations work the exact same way as the sections and plans we created earlier, so everything about the layer setup and updating changes etc. also applies here.

12 Creating schedules

Let's add some more schedules to the project, besides the Door schedule we created in the 'Drawing documentation basic' module. Step 1 to 9 are meant to refresh your memory of how this is done. This time we make a schedule of windows.



1. Go to **Building 2.dwg**.
2. In the **Schedules** tab of the **PROJECT BROWSER**, click *Add Schedule*. A dialog pops up.
3. First, we'll create a window schedule: Enter a name (e.g. **Building 2 – Windows**). Select **Building 2.dwg** in the model field if it is not already selected. In the Data Extraction Definition field, choose for **Windows (BIM).dxd** (this file can be found in your *Supportfolder/Bim/Schedules)*. Choose an appropriate name for the resulting drawing. This will be another sheet, so you could choose a name that is consistent with the sheet you created for the plans and sections.
4. Click **Next**.
5. Tick **off** 'Extract entities from blocks'. Click **Next**.
6. You can now select the properties you want. Click **Finish** to accept the defaults of the .dxd file.
7. The schedule is now shown in the project browser, but it is not generated yet.
8. Right-click the schedule name and click *Update.*
9. Right-click the schedule name and click *Display Schedule.*
10. We see that both schedules have a column '*Story*' showing. This is not very relevant, as the building

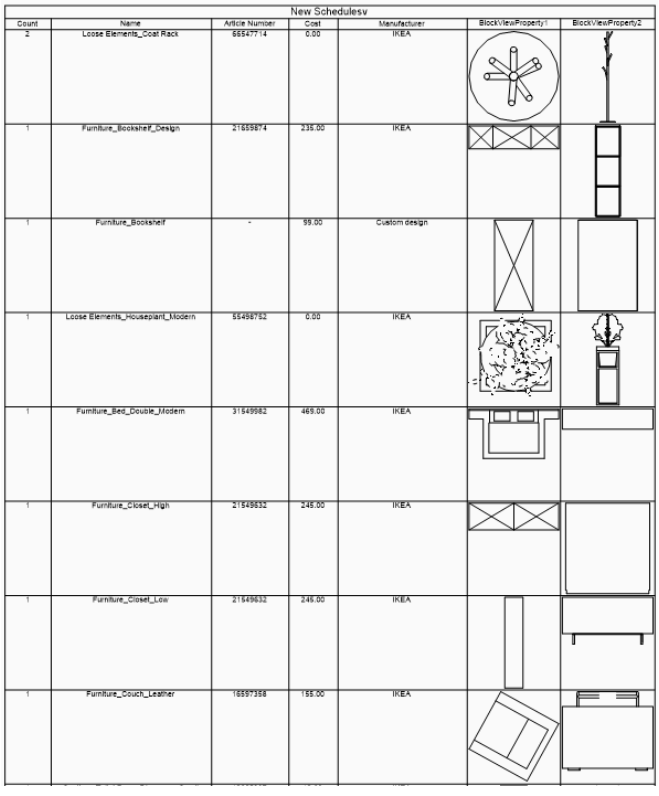
only has one story. So we'll delete this field from the Schedule. You could have done that by deselecting this property in the creation process. The way to do this afterward, however, is by changing the Data Extraction Definition (.dxd file). The files you've used are a set of default .dxd's to help new users on their way. However, every time you go through the schedule wizard a new .dxd file is created in your project folder, with your selected settings. This is then used to create the schedule.

11. Right-click the Windows schedule in the Project Browser, and click *Properties...*
12. In the .dxd field, copy the file path and past it in your Windows Explorer. The file will be opened in a text editor. It is the new .dxd in your project folder that is opened.
13. A .dxd file is a readable file, so it's possible to create your own .dxd's in a simple text editor.
14. Remove the line that says **Story|Story|**
15. Save the file.
16. Do the same for the **Doors (BIM).dxd.**
17. Update both sections; they should now not have any *Story* information showing.

13 Creating a Data Extraction Definition from scratch

The **DATAEXTRACTION** command will, just like the Schedules wizard, make a new .dxd file with your settings, but it will also make a .csv file with your data in it.

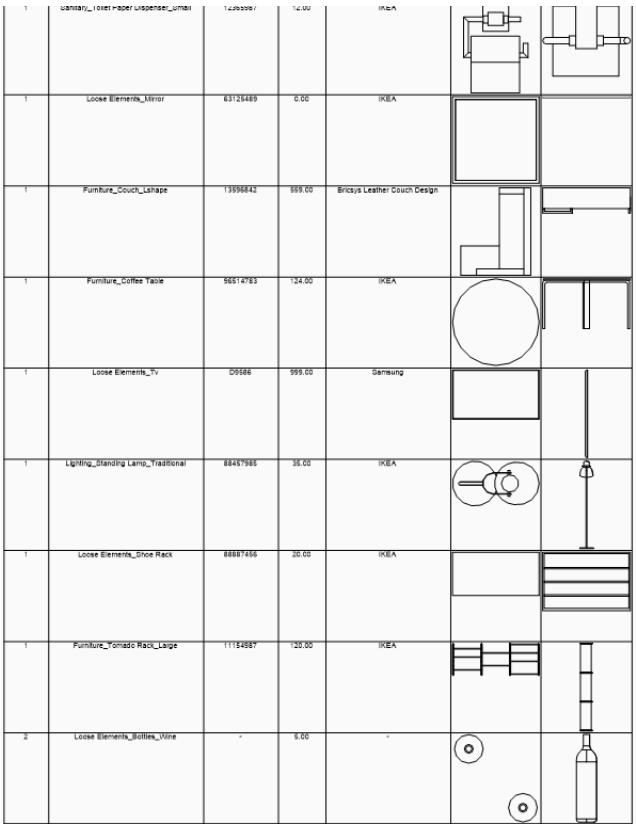
1. Open **Building 2.dwg.**
2. In the Structure Browser, select all Furnishing Elements.
3. Type in **DATAEXTRACTION** in the command line.
4. **Uncheck** the *Extract entities from blocks* box.
5. Check the *Create Data Extraction Definition* box, and choose a file: name it *"FurnishingElements.dxd"* and save it in your project folder.
6. Click **Next.**
7. Select All and click **Next.**
8. Check the three properties in the *Furniture Information* category: **Article Number, Cost, and Manufacturer.**
9. Click **Next**.
10. Click on the three dots next to the *Output to CSV* field. Give in a new name for you .csv file and click **Save**.
11. Click **Finish**.
12. This should have created 2 files: a .csv file containing the results of the dataextraction

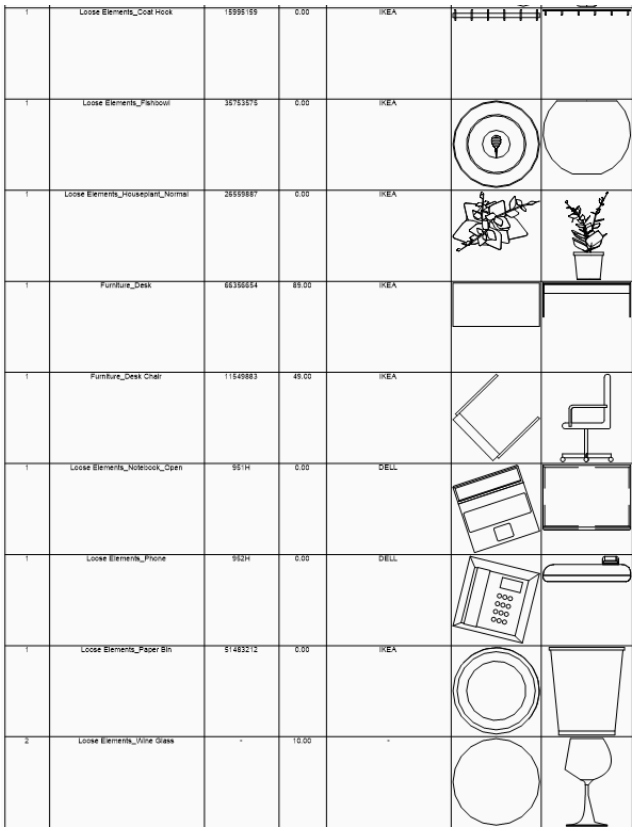


(basically the same as a schedule, but in an external file), and a .dxd file. This .dxd file can now be re-used for creating a schedule.

13. Open the .dxd file in a text editor. We can see 5 sections: **Settings**, **Entity Types, Properties, TableFormatOptions** and **SELECTION SET.**
14. The **Settings** we will leave as they are
15. The **Entity Types** are chosen because of the selection set we had active when using data extraction. However, instead of explicitly choosing which types (and handles, see later) we want to extract data from, we will just replace the explicit entity types by an asterisk (*), to define that we want to extract information from **all** entity types.
16. The **Properties** we will leave as they are.
17. The **TableFormatOptions** we will leave as they are.
18. We can delete the entire **SELECTION SET** section, because again we don't want to explicitly define which entities we'll be extracting data from. We'll do this by adding a filter.
19. We can add a filter by adding a new section:
    The section title is called `[Filter]`
    The section content is
    `(Type == Furnishing Element)`
    (cfr. the .dxd files that are given as example in the support folder, there a Filter on Door and Window type is used).
20. Thus, the contents of the .dxd file should be as follows:

```
[Settings]
ExtractFromBlocks=0
ExtractFromXrefs=1
CountXrefs=0
CombineEqualRows=1
IncludeNameColumn=1
FooterStyle|0
FlowDirectionRtoL|0

[Entity Types]
*

[Properties]
Article Number~User|Article Number|
Cost~User|Cost|%lu2%pr2
Manufacturer~User|Manufacturer|

[TableFormatOptions]
TableStyle=Standard
TitleCellStyle=Title
HeaderCellStyle=Header
DataCellStyle=Data

[Filter]
(Type == Furnishing Element)
```





21. Save this .dxd file in your project folder.
22. In the Project Browser, click *Add Schedule* and give it an appropriate name (e.g. Building 2 – Furnishing Elements). Select **Building 2.dwg** in the model field if it is not already selected. In the Data Extraction Definition field, choose for the

.dxd file you just saved. For the result drawing, choose a new drawing.

Update the schedule and display it. You should now have a new schedule, containing information about furniture elements: Cost, Manufacturer, Article Number, Count and BlockViewProperties.

14 Creating sheet set templates

1. The sheet set templates are stored in the *C:\Users\<user_name>\AppData\Local\Bricsys\BricsCAD\Vxx\en_US\Templates* folder.
2. If you want to edit an existing template, you have two options. Either you edit it directly, or you make a copy.
3. To edit it directly, you can go to **Open** under the BricsCAD icon, choose .dwt in the 'Files of type' drop-down and choose the file you want to edit. You can then make the modifications and save the file.
4. To make a copy, double-click on the .dwt file you want to copy. A new .dwg with this template will open. Make your modifications and save your file as .dwt. Save it in the templates folder to easily use the copied template in a new drawing.
5. If you have saved the template .dwt to the sheet set templates folder, you will see it appear when you use the New Wizard to open a new drawing. You will also be able to select it as the template for the creation of generated drawings in the sheet set set-up of the Project Browser.
6. What can you store into a template?
   You can store the following things by using them in your .dwt file:
   a. Title block
   b. Layers
   c. Colors
   d. Line types
   e. Hatch patterns
   f. Blocks
   g. Text styles
   h. Dimension styles
   i. Page set-ups

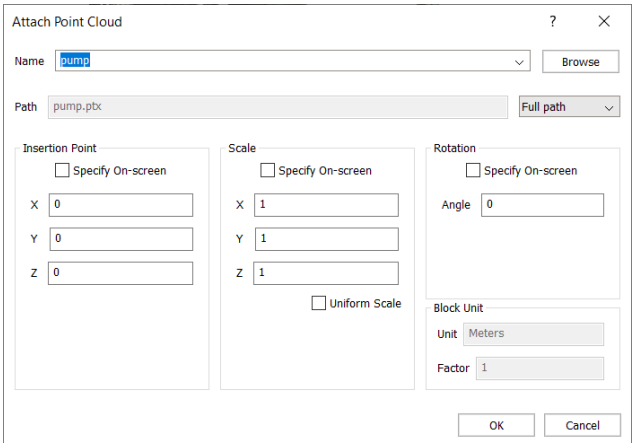
Point clouds

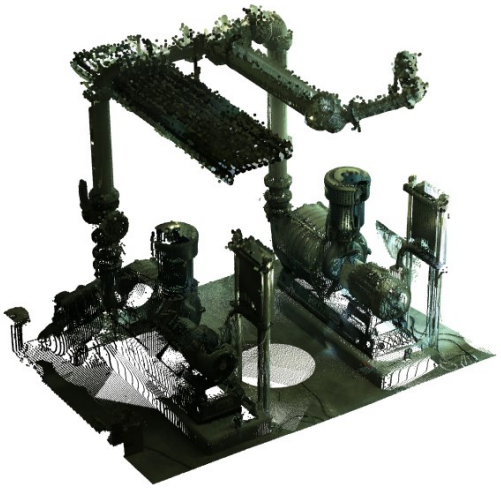
This module explains how to load point clouds into BricsCAD and work with them. It also shows you a 3D model that was made based on point cloud data.

1 **Open Pointclouds.dwg which is made from a m template**

2 **Attach a point cloud**

1. To begin we will attach a point cloud with the **ATTACHPOINTCLOUD** command. We can attach different formats including: .las, .pts, .ptx, .rcp and .rcs.
2. Click **ATTACHPOINTCLOUD** .
3. Choose 'from File', by typing **F**.
4. Choose the Pump ptx file from your local machine and click **Open**.
5. Uncheck all checkboxes in the Attach Point Cloud window and hit **OK**.
6. Wait for the pop-up message that pre-processing of the point cloud is done. **NOTE**: the point cloud is being pre-processed automatically, as well as cached to you cache folder.
7. **REGEN** your drawing, by typing in the command. Your point cloud should now appear.





3 **Change point cloud point size**

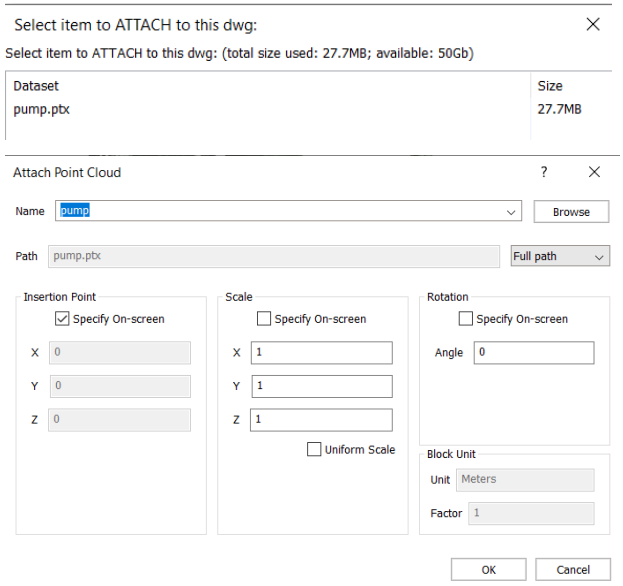
1. Decrease point cloud point size, by clicking the icon once.
2. You see that the points become smaller and they don't form a smooth drawing. So if we increase the point size again, we see a smoother preview.
3. Increase point cloud point size, by clicking the icon twice.

4 **Change the amount of shown points**

1. Decrease **POINTCLOUDPOINTMAX**, by typing in this command and changing its value to **500 000**.
   NOTE: when we want to decrease the number of points that we see, for faster visualization purposes, for example, our image will still be relatively smooth thanks to the bigger point size.
2. Increase **POINTCLOUDPOINTMAX** again, by typing in this command and changing its value back to **4 000 000**.

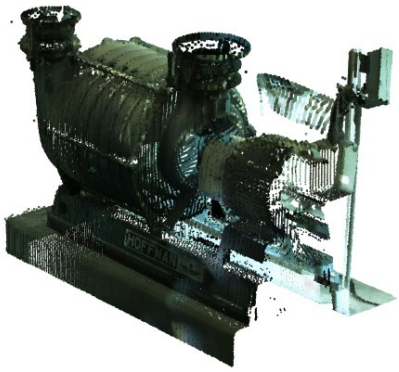
5 **Insert another instance of an already pre-processed point cloud**

1. Type in the command **POINTCLOUDREFERENCE**.
2. Choose the **pump.ptx** from the list of pre-processed point clouds present in your cache folder.
3. Tick **Specify On-screen** and click **OK** in the Attach Point Cloud window.
4. Now place the point cloud somewhere in your drawing.



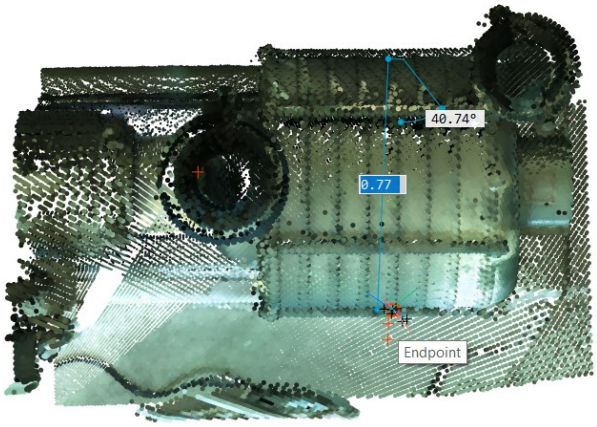
5 **Clip the display of a point cloud**

1. Make a section box around the part of the pump you want to isolate.
   NOTE: you can always rotate the section box with the Manipulator.
2. **CLIPDISPLAY**  the section box.
3. Orbit around the point cloud.
   NOTE: you see that while you are moving the points become a bit blurry. This is for faster preview. If you stay still for a while all the points will become visible.



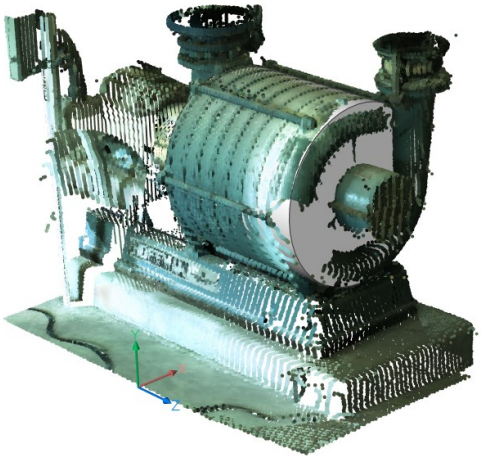
6 **Measure a distance in a point cloud**

1. Turn on **ESNAP**.
2. Measure the diameter of the pump for example.
   NOTE: you can snap towards points of the point cloud to make this an easy job.



7 **Draw a cylinder to start modeling the pump**

1. Change your UCS by typing in **UCS** in the command line and aligning it with your section box.
2. Draw a cylinder using the **CYLINDER**  icon from the Primitives.
3. Specify the half of the diameter, that you just measured, as the radius.
4. Snap to the other end of the pump to specify the height.



8 **Crop a point cloud**

1. Unclip the section box.
2. Right-click on the Lookfrom widget and select **UCS** instead of WCS and turn **Perspective** off.

3. Click on the **Back** view icon of the Lookfrom widget.

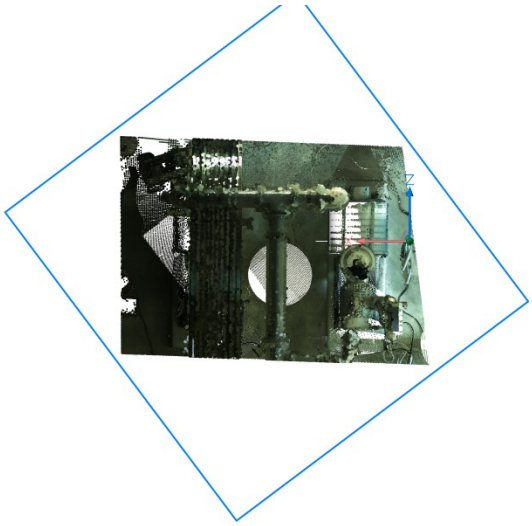
4. Go to the Insert tab and click **CROP**  from the 'pointclouds' section.

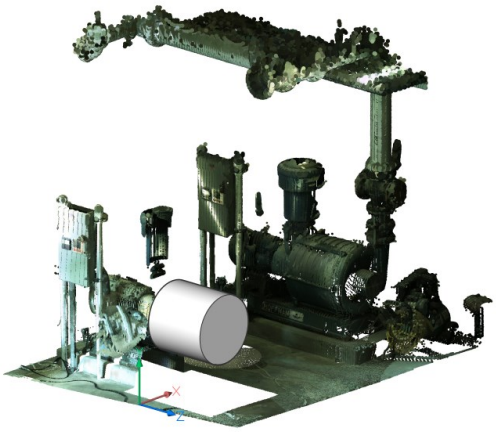
5. Select the pointcloud you just modeled onto.

6. Choose **R** for Rectangular crop.

7. Draw a rectangle over the area you want to crop out, for example the area where you modeled your pump.

8. View your model in its context!





9 View a 3D model modeled after a point cloud

1. Open **Church.dwg**. In this file, you find a 3D model of a church that was modeled after a point cloud.